United States Government Accountability Office

Report to Congressional Requesters

FEDERAL RESEARCH

Additional Actions Needed to Improve Public Access to Research Results

Accessible Version

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GAO-20-81

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GAO Highlights

Highlights of GAO-20-81, a report to congressional requesters

Why GAO Did This Study

Research and development helps catalyze breakthroughs that improve the overall health and wellbeing of our society. Federal research and development expenditures averaged about $135 billion annually for fiscal years 2015 to 2017. According to OSTP, providing free public access to federally funded research results can improve both the impact and accountability of this important federal investment. In February 2013, OSTP directed federal agencies with more than $100 million in annual research and development expenditures to develop a plan to support increased public access to the results of federally funded research.

GAO was asked to examine public access to federally funded research results. This report examines the extent of agencies' (1) progress implementing plans to increase public access to federally funded research results and (2) coordination on public access plan implementation. GAO administered a questionnaire to 19 federal agencies selected based on annual research and development expenditure amounts, among other criteria; reviewed agency documents; and interviewed officials from 11 agencies, OSTP, and 21 stakeholder organizations.

What GAO Recommends

GAO is making 37 recommendations to 16 agencies to promote full and effective implementation of agency public access plans. For example, GAO recommends that OSTP and 5 agencies leading a public access interagency group take steps to fully implement selected leading collaboration practices. Of the 16 agencies, 15 agreed with GAO's recommendations while 1 (OSTP) disagreed. GAO continues to believe the recommendation to OSTP is warranted.

View GAO-20-81. For more information, contact John Neumann at (202) 512-6888 or neumannj@gao.gov.

What GAO Found

The 19 agencies that GAO reviewed have made progress implementing their plans to increase public access to federally funded research results (publications and data), as called for in a 2013 Office of Science and Technology Policy (OSTP) memorandum. However, some agencies have not fully implemented some aspects of their plans, in particular those related to data access and mechanisms to ensure researchers comply with public access requirements.

Examples of Agencies' Progress Implementing Plans to Increase Public Access to Federally Funded Research Results

Public access plan topic	Extent of agency progress
Repositories	All 19 agencies have identified federally owned or managed locations, known as repositories, for preservation and public access to publications. For data, agencies rely on an array of federal and nonfederal repositories. However, seven agencies have not taken steps, such as establishing a single web-based point of access, or have not fully implemented plans to help the public find data stored across repositories. Taking such steps could better support public access to federally funded data.
Data management plans (DMPs)	Sixteen of 19 agencies reported requiring researchers to submit a DMP, which is supposed to describe how researchers will provide for long-term preservation and access to data they generate, or a justification for why that cannot be done. However, four agencies reported they have not established such requirements or have done so on a limited basis. Without requiring DMPs from agency-funded researchers, agencies may not be able to ensure that agency-funded data are being made publicly available.
Compliance	Eleven agencies reported that they have not fully developed or implemented mechanisms to ensure researchers comply with applicable public access requirements. Officials cited several reasons for this, including resource constraints and difficulty with tracking and measuring compliance. Without fully implementing compliance mechanisms—as called for in the OSTP memorandum—agencies may not have assurance that all appropriate federally funded research results are being made publicly available.

Source: GAO analysis of agency public access plan implementation efforts. | GAO-20-81

Agencies are coordinating with each other and with nonfederal stakeholders to implement public access plans, including through an interagency group led by OSTP and five other agencies. However, the group has not fully implemented selected leading practices identified by GAO that can enhance and sustain interagency collaboration, such as defining and articulating common outcomes. For example, according to OSTP staff, key outcomes have not yet been decided upon. Agency officials and stakeholders identified several challenges to implementing public access plans that interagency coordination might help them address, such as

- Absence of common standards in several areas;
- Measuring effectiveness of public access plan implementation; and
- Balancing providing public access with safeguarding sensitive information.

By taking steps to fully implement relevant leading collaboration practices, the interagency group could help agencies better marshal their collective efforts to address common challenges to public access plan implementation.

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Abbreviations

ACL	Administration for Community Living
AHRQ	Agency for Healthcare Research and Quality
CDC	Centers for Disease Control and Prevention
COMPETES	America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science
DHS	Department of Homeland Security
DMP	Data Management Plan
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
Education	Department of Education
EPA	Environmental Protection Agency
ERIC	Education Resources Information Center
FDA	Food and Drug Administration
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
NSTC	National Science and Technology Council
OSTP	Office of Science and Technology Policy
PMC	PubMed Central
RPPR	Research Performance Progress Reports
Subcommittee	NSTC Subcommittee on Open Science
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VA	Department of Veterans Affairs

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November 21, 2019

The Honorable Eddie Bernice Johnson
Chairwoman
Committee on Science, Space, and Technology
House of Representatives

The Honorable John Thune
United States Senate
The Honorable F. James Sensenbrenner, Jr.
House of Representatives

Research and development expenditures by the federal government, averaging about $135 billion annually for fiscal years 2015 to 2017, catalyze scientific and technological breakthroughs that benefit our economy, strengthen our national security, and improve the overall health and well-being of our society.[1] The results arising from federal research and development expenditures can take a variety of forms, including data and peer-reviewed publications (federally funded research results). Academic researchers generally have access to publications through their institutions' subscriptions to scientific journals. Access for others, including nontraditional researchers, entrepreneurs, and industry may be more limited. As for the data resulting from federally funded research, access for both researchers and the public can vary by scientific discipline. According to the White House Office of Science and Technology Policy (OSTP), providing free public access to federally funded research results can improve both the impact and accountability of this important federal investment.

On February 22, 2013, OSTP issued a memorandum for the heads of executive departments and agencies titled *Increasing Access to the Results of Federally Funded Scientific Research* (OSTP memo). Among other things, the memo directs each federal agency with more than $100

[1]Data on federal research and development expenditures are from the National Science Foundation (NSF), National Center for Science and Engineering Statistics, *Survey of Federal Funds for Research and Development, Fiscal Years 2015-2017* (April 2017), the most recently available data at the time of our review. The National Science Foundation's *Survey* uses the term "outlay," which is synonymous with the term expenditure. See GAO, *A Glossary of Terms Used in the Federal Budget Process*, GAO-05-734SP (Washington, D.C.: September 2005).

million in annual research and development expenditures to develop a plan to support increased public access to the results of federally funded research, in particular publications and data.[2] According to the OSTP memo, among other things, each agency plan must:

- Facilitate easy public search, analysis of, and access to federally funded research publications;
- Maximize access, by the general public and without charge, to digitally formatted scientific data created with federal funds while respecting other specified interests;[3]
- Ensure that federally-funded researchers develop data management plans, as appropriate, describing how they will provide for long-term preservation of, and access to, scientific data in digital formats resulting from federally funded research, or explaining why long-term preservation and access cannot be justified;
- Support training, education, and workforce development related to scientific data management, analysis, storage, preservation, and stewardship;
- Ensure full public access to publications' metadata—which provides descriptive information about other data, such as the source of the data and when it was last updated—without charge upon first publication in a data format that ensures interoperability with current and future search technology;[4]
- Outline options for developing and sustaining repositories for scientific data in digital formats, taking into account the efforts of public and private sector entities; and
- Include a strategy for measuring and, as necessary, enforcing compliance with the agency's plan.

[2]Office of Science and Technology Policy, *Increasing Access to the Results of Federally Funded Scientific Research*, Memorandum (Washington, D.C.: Feb. 22, 2013).

[3]Specifically, such interests include: (1) protecting confidentiality and personal privacy; (2) recognizing proprietary interests, business confidential information, and intellectual property rights and avoiding significant negative impact on intellectual property rights, innovation, and U.S. competitiveness; and (3) preserving the balance between the relative value of long-term preservation and access, and the associated cost and administrative burden.

[4]See GAO, *Open Data: Treasury Could Better Align USAspending.gov with Key Practices and Search Requirements*, GAO-19-72 (Washington, D.C.: Dec. 13, 2018) for the metadata definition.

All departments and agencies subject to the memorandum have developed public access plans consistent with the objectives in the memo, according to a January 2017 OSTP update. At that time, OSTP also stated that agencies were moving ahead with implementation of the plans.

We were asked to examine public access to federally funded research results. This report examines the extent to which agencies (1) have made progress in implementing plans to increase public access to federally funded research results, and (2) are coordinating on public access plan implementation.

The scope of our review included 19 federal agencies.[5] As stated above, the OSTP memo applies to federal agencies with over $100 million in annual research and development expenditures. Accordingly, we identified agencies by (1) examining data published by the National Science Foundation (NSF) on annual research and development expenditures as of October 2016,[6] and (2) asking agencies if they were subject to the OSTP memo and if they had developed public access plans.[7] The agencies we identified for our review included the:

- Departments of Agriculture (USDA), Defense (DOD), Education, Energy (DOE), Homeland Security (DHS), Transportation (DOT), and Veterans Affairs (VA);
- Administration for Community Living (ACL), Agency for Healthcare Research and Quality (AHRQ), Centers for Disease Control and Prevention (CDC), Food and Drug Administration (FDA), and National

[5]As the OSTP memo does not define "agency," for the purposes of this report, we define an agency as a cabinet-level department, agency, or sub-component thereof, including, but not limited to, an office, institute, or center, unless otherwise specified. Some agencies created a public access plan applying broadly to all subcomponent agencies within the agency. In other cases, agencies' subcomponent agencies developed their own public access plans. Given different organizational structures within each of the agencies we selected for review, we relied on each agency to identify the appropriate subcomponent agencies and officials to provide information in response to our requests.

[6]National Science Foundation, National Center for Science and Engineering Statistics, *Survey of Federal Funds for Research and Development*, *Fiscal Years 2015-2017* (April 2017). NSF data include expenditures for basic research, applied research, and development. For the purposes of this report, we generally refer to these as research expenditures. We determined that the NSF expenditure data were sufficiently reliable for initially identifying the agencies that were likely subject to the OSTP memo.

[7]For additional information regarding our agency selection, please see app. I.

Institutes of Health (NIH) within the Department of Health and Human Services (HHS);

- National Institute of Standards and Technology (NIST) and National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce;
- U.S. Geological Survey (USGS) within the Department of the Interior; and
- Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), NSF, and U.S. Agency for International Development (USAID).

For both objectives, we:

- Administered a questionnaire to all 19 identified agencies in our scope and conducted content analyses of the responses. Based on the elements included in the OSTP memo, our questionnaire included questions related to:
  - Implementation of public access plans;
  - Publication and data repositories;
  - Web-based mechanisms for providing public access to publications and data, and metrics on the use of these mechanisms;
  - Data management plans;
  - Resources for implementing public access plans;
  - Agency compliance with the OSTP memo as well as researcher compliance with agencies' public access requirements;
  - Coordination with federal agencies and other stakeholders; and
  - Training.
- Reviewed selected agency documents, including agencies' public access plans, as well as documents identified by agency officials as pertinent to implementing their plans, such as policies, procedures, regulations, guidance, manuals, contracts, financial assistance agreements, memorandums of understanding, and performance reports.
- Interviewed officials from a nonprobability sample of 11 of the 19 agencies, selected to achieve a diverse cross-section of agencies based on criteria such as the amount of research and development expenditures, in order to supplement and clarify questionnaire

information. While the results cannot be projected to all 19 agencies we reviewed, they represent a mix of agencies based on our selection criteria.

- Interviewed OSTP staff to gain an understanding of their perspectives on agency progress, challenges, and coordination, and reviewed OSTP-related documentation, including charters and reports.
- Interviewed a nonprobability sample of 21 stakeholder organizations representing universities, academics, nonprofit and for-profit publishers, industry researchers, libraries, nongovernmental organizations, and federally funded researchers. Stakeholder organizations were judgmentally selected based on several factors to obtain viewpoints from a diverse cross-section of stakeholders by entity type. We identified and selected the stakeholder organizations based on information gathered in a review of selected literature and background interviews with agency officials and others. We generally asked the stakeholders their views on agency public access plan implementation, including any implementation challenges. We performed content analysis of information obtained from stakeholders.

To evaluate agencies' progress in implementing public access plans, we compared agencies' efforts to the directives specified in the OSTP memo, and to federal standards for internal control, as appropriate.[8] To assess interagency coordination on public access issues, we reviewed agency coordination efforts identified in our interviews and also compared the efforts of an OSTP co-led interagency group to the OSTP memo and to selected leading practices for enhancing and sustaining interagency collaboration identified in an October 2005 GAO report.[9] We selected three of the eight leading practices based on their relevance to the operations of the interagency coordination efforts we identified.[10] These three practices included defining and articulating common outcomes; agreeing on roles and responsibilities; and developing mechanisms to monitor, evaluate, and report on results. In this report, and in our past

[8]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014).

[9]GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

[10]We excluded from our review five leading practices related to reinforcing agency accountability; individual accountability for collaborative efforts; establishing mutually reinforcing or joint strategies; identifying and addressing needs by leveraging resources; and establishing compatible policies, procedures, and other means to operate across agency boundaries.

work, we define collaboration as any joint activity that is intended to produce more public value than could be produced when organizations act alone.[11]

We conducted this performance audit from November 2017 to November 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section provides information on public access to federally funded research results, and the federal research funding process.

Public access to federally funded research results. OSTP was established in 1976 to provide advice on the scientific, engineering, and technological aspects of issues that require attention at the highest levels of government.[12]

On February 22, 2013, OSTP issued a memorandum for the heads of executive departments and agencies titled *Increasing Access to the Results of Federally Funded Scientific Research* (OSTP memo). As stated above, the OSTP memo directs each federal agency with more than $100 million in annual research and development expenditures to develop a plan to support increased public access to the results of

[11]We also refer to coordination as collaboration in our work.

[12]Pub. L. No. 94-282, Title II, 90 Stat. 459, 463 (May 11, 1976).

federally funded research, in particular publications and data.[13] Though the goal of the OSTP memo is to make federally funded research publications and data publicly available, there are other priorities that may impact achieving that goal. For example, the OSTP memo notes that public access to federally funded research results must be consistent with law and policy; agency mission; resource constraints; and U.S. national, homeland, and economic security. Furthermore, the OSTP memo directs each agency to identify in their plan resources within their existing agency budget to implement their plan. Additionally, the OSTP memo requires agencies' public access plans to maximize access, by the general public and without charge to digitally formatted scientific data created with federal funds, while also: (1) protecting confidentiality and personal privacy; (2) recognizing proprietary interests, business confidential information, and intellectual property rights, and avoiding significant negative impacts on intellectual property rights, innovation, and U.S. competitiveness; and (3) preserving the balance between the relative value of long-term preservation and access, and the associated cost and administrative burden.

The OSTP memo identifies numerous elements agencies must address in their public access plans. For example, each agency plan must ensure public access to publications within an appropriate time frame, generally within 1 year of publication. The OSTP memo also directs that agency plans must ensure federally funded publications are stored in an archival solution that, among other things, provides for long-term preservation and access to the content without charge. Furthermore, agency plans must provide for the assessment of long-term needs for the preservation of scientific data in fields that the agency supports and outline options for developing and sustaining repositories for scientific data in digital formats, taking into account the efforts of public and private sector entities. We refer to both archival solutions for publications and repositories for data as "repositories." The OSTP memo states publication repositories could

[13]For the purposes of this report, publications and data are defined in accordance with the definitions in the OSTP memo. The OSTP memo defines publications as those published in peer-reviewed scholarly publications that are based on research directly arising from federal funds. In this report, we refer to peer-reviewed manuscripts, research papers, or scholarly publications as publications unless otherwise specified. The OSTP memo defines data as the digital recorded factual material commonly accepted in the scientific community as necessary to validate research findings, including data sets used to support scholarly publications. According to the OSTP memo, this definition does not include laboratory notebooks, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects such as laboratory specimens.

be maintained by the federal agency funding the research, through an arrangement with other federal agencies, or through other parties working in partnership with the agency, including scholarly and professional associations, publishers, and libraries.

The OSTP memo also directs agencies to develop public access plans that ensure that all extramural researchers receiving federal grants and contracts for scientific research, as well as all intramural researchers, develop data management plans (DMPs), as appropriate. DMPs are to either describe how the researcher will provide for the long-term preservation of, and access to, scientific data in digital formats resulting from federally funded research, or explain why long-term preservation and access cannot be justified. Agency public access plans also must ensure appropriate evaluation of the merits of submitted DMPs.

Table 1 shows the 19 agencies included in our review, along with the effective date of each agency's public access plan.[14]

Table 1: Agency Public Access Plan Effective Dates

Agency	Month and year plans went into effect
Administration for Community Living (ACL)[a]	October 2016
Agency for Healthcare Research and Quality (AHRQ)[a]	October 2015
Centers for Disease Control and Prevention (CDC)[a]	January 2015
Department of Agriculture	November 2014
Department of Defense	February 2015
Department of Education	October 2016
Department of Energy	July 2014
Department of Homeland Security	December 2016
Department of Transportation	December 2015
Department of Veterans Affairs	July 2015
Environmental Protection Agency (EPA)	November 2016[b]
Food and Drug Administration (FDA)[a]	February 2015
National Aeronautics and Space Administration	December 2014
National Institute of Standards and Technology (NIST)[c]	December 2014
National Institutes of Health (NIH)[a]	February 2015

[14]For more information on how we identified the agencies included in our review, please see app. I.

Agency	Month and year plans went into effect
National Oceanic and Atmospheric Administration (NOAA)[c]	February 2015
National Science Foundation	March 2015
U.S. Agency for International Development	October 2016
U.S. Geological Survey (USGS)[d]	October 2016

Source: GAO analysis of agency public access plans. | GAO-20-81

[a]ACL, AHRQ, CDC, FDA, and NIH are sub-component agencies of the Department of Health and Human Services.

[b]EPA officials stated that the effective date for implementing public access plan requirements for intramural research under the agency's Office of Research and Development was October 2015.

[c]NIST and NOAA are sub-component agencies of the Department of Commerce.

[d]USGS is a sub-component agency of the Department of the Interior.

The OSTP memo was developed with input from the National Science and Technology Council (NSTC) and the public, in compliance with the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science (COMPETES) Reauthorization Act of 2010.[15] The NSTC was created in 1993 and is charged with coordinating the science and technology policymaking process, among other things.[16] All executive departments and agencies must coordinate science and technology policy through the NSTC. According to the White House website, the work of the NSTC is organized under six primary committees with each of these committees overseeing subcommittees and working groups focused on different aspects of science and technology. The NSTC Subcommittee on Open Science (Subcommittee), within the Committee on Science, is an interagency group working on public access issues. According to OSTP staff, the co-chairs of the Subcommittee include OSTP, NIH, NSF, DOE, NOAA, and DOD.

Though the OSTP memo was issued in 2013, some agencies were already making some of their federally funded research results (including publications and data) publicly available. The OSTP memo notes this, stating that some federal agencies already had policies that partially met the requirements of the memo, and that those agencies should adapt those policies, as necessary, to fully meet the requirements in the memo.

[15]Section 103 of this Act required the Director of OSTP to convene a working group under the NSTC to coordinate federal science agency research and policies related to the dissemination and long-term stewardship of the results of unclassified research, including digital data and peer-reviewed scholarly publications, supported wholly, or in part, by funding from the federal science agencies. Pub. L. No. 111-358, § 103, 124 Stat. 3982, 3986-88 (Jan. 4, 2011) (codified at 42 U.S.C. § 6623).

[16]Executive Order No. 12881, 58 Fed. Reg. 62491 (issued Nov. 23, 1993).

For example, under the Omnibus Appropriations Act, 2009, NIH must require all investigators funded by NIH to submit or have submitted for them an electronic version of their final, peer-reviewed manuscripts to PubMed Central (PMC) upon acceptance for publication. The manuscripts are to be made publicly available no later than 12 months after the official date of publication.[17]

Research funding and publication process. Federal agencies fund two types of researchers—intramural and extramural. Intramural researchers include agency scientists who conduct research, such as in agency laboratories and clinics. Extramural researchers include scientists and research personnel working at universities, academic medical centers, and other research institutions who receive grants and other types of federal funding to conduct research. Generally, the institution or university where a researcher is employed enters into a contract or financial assistance agreement with a federal agency funding the research.[18] After receiving funding, a researcher performs research as specified in the contract or financial assistance agreement. Based on the research conducted, federally funded intramural or extramural researchers may develop results, including draft papers summarizing their findings, datasets, or other types of results. Researchers may then submit draft papers to publishing companies or academic societies for peer review of the scientific findings and the work conducted. If favorably reviewed during the peer review process, these papers may then be published in journals produced by the publishing companies or societies. Datasets stemming from federally funded research may be associated with peer reviewed publications, or may be developed without connection to a peer reviewed publication. Agencies, publishing companies, academic institutions or other entities may maintain repositories where publications or datasets are stored along with metadata to ensure the public can find and use these research results.

[17]Pub. L. No. 111-8, Div. F, Title II, § 217, 123 Stat. 524, 782 (Mar. 11, 2009) (codified at 42 U.S.C. § 282c). The law also required NIH to implement this public access policy in a manner consistent with copyright law. PMC is a free, full-text archive of biomedical and life sciences journal literature. According to PMC's website, since its inception in 2000, PMC has grown to contain more than 5 million full-text records and serves as a digital counterpart to the National Library of Medicine's extensive print journal collection.

[18]This general process may vary depending on the agency's statutory authority, the type of federal funding, and other factors.

Agencies Have Made Progress Implementing Public Access Plans, but Some Have Not Fully Implemented Some Aspects of Their Plans

Agencies have made progress implementing plans to increase public access to federally funded research results, but some have not fully implemented some aspects of their plans, in particular facilitating access to data and developing compliance mechanisms. This section of the report provides information on agencies' progress in five parts:

- All agencies we reviewed have identified federally owned or managed repositories for publications. However, some have not taken steps or have not fully implemented plans to facilitate public access to data distributed across federal and nonfederal repositories.
- Most agencies reported requiring data management plans, although some have not evaluated the need for or developed training or guidance for their review.
- All agencies established metadata requirements or guidance.
- Almost all agencies established machine readability requirements or guidance.
- Most agencies have not fully implemented mechanisms to oversee researcher compliance with agency public access requirements.

Agencies Have Identified Repositories for Publications, but Some Agencies Have Not Taken Steps to Facilitate Public Access to Data

Repositories for Publications

All 19 agencies we reviewed have established or identified federally owned or managed repositories to support public access to agency-funded publications.[19] About half of the agencies (10 of 19) reported relying on NIH's PubMed Central (PMC) to store and make agency-

[19]The OSTP memo states that publications repositories could be maintained by the federal agency funding the research, through an arrangement with other federal agencies, or through other parties working in partnership with the agency including, but not limited to, scholarly and professional associations, publishers, and libraries.

funded publications publicly available.[20] According to the OSTP memo, agencies' public access plans are to ensure that publications are stored in an archival solution that, among other things, provides for long-term preservation. Furthermore, agencies' public access plans must facilitate easy public search, analysis of, and access to federally funded publications. All 19 agencies reported accomplishing this by identifying repositories for the publications they fund. Appendix II lists the publication repositories identified by each agency.

In addition to agencies identifying federally owned or managed publication repositories, we identified some instances where agencies are also leveraging nonfederal sources to further enhance or provide public access to publications. For example, seven agencies reported they have agreements with the publisher consortium CHORUS, in which publishers have agreed to make federally funded publications publicly available via a link to the relevant publisher's repository a year after publication.[21] Similarly, NIH reported it has established agreements with publishers to deposit NIH-funded researcher publications directly into NIH's PMC repository, where they are made available no later than a year after publication. We also identified some instances where agencies have established agreements with other agencies to provide access to publications in cases where a researcher is funded by multiple agencies. For example, a partnership between DOE and DOD permits researchers funded by both of these agencies to submit their publication once using a jointly developed web-based mechanism, reducing the burden on the researcher, according to DOE officials. A similar partnership exists between DOE and NSF for jointly funded research using different mechanisms, according to DOE and NSF officials.

Repositories for Data

Federally funded data are distributed across federal and nonfederal repositories, which differ by scientific discipline, and some agencies have not taken steps or have not fully implemented plans to facilitate finding these data. According to the OSTP memo, agencies' public access plans

[20]The following agencies reported using NIH's PMC as their primary publications repository: ACL, AHRQ, CDC, DHS, EPA, FDA, NASA, NIH, NIST, and VA.

[21]The seven agencies that reported having an agreement with CHORUS are DOD, DOE, NIST, NSF, USAID, USDA, and USGS. The publications made publicly available through CHORUS typically include all modifications from the publishing peer-review process, copyediting, stylistic edits, and formatting changes.

must include a strategy for improving the public's ability to locate and access digital data resulting from federally funded scientific research. In addition, according to the OSTP memo, these plans must promote the deposit of data in publicly accessible databases, where appropriate and available. The plans must also outline options for developing and sustaining repositories for scientific data in digital formats, taking into account the efforts of public and private sector entities. To improve data access, agency plans must encourage cooperation with the private sector, including through the formation of public-private partnerships with foundations and other research funding organizations.

The agencies we reviewed reported relying on a variety of federal and nonfederal data repositories to make data from the research they fund publicly available. All 19 agencies' public access plans allow researchers to deposit their data in a repository of their choosing, although some agencies recommend specific repositories.[22] For example, Education guidance lists six data repositories that researchers should consider because they are known to the department and to current grantees. We also found some instances where agencies do not require researchers to deposit data into specific repositories but provide guidance on factors that researchers should consider when selecting one. For example, DOT guidance says researchers should demonstrate that a repository they select has a documented plan for long-term preservation and enables users to find and use the data. Still other agencies reported having limited guidance on selecting a data repository or requiring researchers to identify the one they will use in their data management plan (DMP).[23] For example, according to FDA's public access plan, FDA expects that researchers would make data sets publicly accessible in discipline-specific data repositories, wherever available.

[22]We found some instances where agencies reported requiring the deposit of agency-funded intramural data in certain repositories, but the same requirements did not exist for extramural researchers. For example, NIST officials reported that NIST intramural researchers are required to deposit their data in an assessed and authorized repository, but did not report requiring this for extramural researchers. In addition, some agencies direct researchers to use a designated repository but also will accept researchers' proposals to use alternative repositories.

[23]DOE, FDA, NASA, and NSF direct researchers to identify the data repository they intend to use in their data management plans, while AHRQ, DOD, DHS, and VA are continuing to evaluate how to make agency-funded data subject to their agencies' public access plans publicly available.

Some stakeholders and agency officials described challenges created by the landscape of diverse, discipline-specific data repositories. For example, according to several stakeholders, the diverse landscape of repositories can make it challenging to access or analyze data sets stored across multiple repositories. Similarly, FDA officials stated that the lack of a centralized mechanism for researchers to access data hinders information sharing because, even when data are public, researchers must spend additional time searching for the data they need.[24]

Most agencies we reviewed (12 of 19) reported having web-based mechanisms, such as a single web-based point of access that the public could use to find data produced through funding by these agencies.[25] For example, according to EPA officials, EPA is deploying a new search engine that will enhance discovery of its public information, including data it funded. As another example, NIH reported it is developing a mechanism, using industry standard web-based technologies, to allow biomedical researchers to access NIH-funded data resources. USAID officials stated that USAID is pursuing rulemaking to codify its Development Data policy, which requires submission of data sets to the agency's in-house central data repository.[26] We also found instances where agencies reported using metadata that uniquely identifies datasets to make them easier for Internet search engines to find. For example, according to DOE officials, DOE provides a service to assign data sets persistent identifiers—long-lasting web-based references to objects like documents, web pages, publications, or data, which aid in data citation and discovery.

Other agencies (7 of 19) reported they have not taken steps or have not fully implemented plans, such as establishing a single web-based point of access, to help ensure the public can find federally funded data sets

[24]FDA officials said a member of the public could find data FDA funded by accessing its publicly available publications, which often include a reference or link to the underlying data.

[25]These 12 agencies are ACL, CDC, DOE, DOT, EPA, NASA, NIH, NIST, NOAA, USDA, USAID, and USGS.

[26]According to USAID officials, these policy requirements are applicable to existing awards.

potentially stored across multiple federal or nonfederal repositories.[27] Officials from these agencies provided a variety of reasons for why they have not established such a point of access, with some agency officials outlining future plans or strategies for making their agency's funded data accessible. Specifically,

- **AHRQ.** AHRQ does not have a single web-based point of access for AHRQ's data as it is still identifying strategies for making data publicly available.
- **DHS.** DHS officials said that they do not have a way for a member of the public to search for and access DHS-funded data. DHS officials added that the agency is in the process of establishing a data repository and that they plan to develop a mechanism to help the public find data. They did not provide additional details on how this would be achieved.[28]
- **DOD.** According to DOD officials, some of the agency's data is being made available. DOD is planning to establish a catalogue that will point to data sets, but a timeframe for implementation has not been identified.
- **Education.** Education officials reported that the agency will begin making changes to its publications repository, Education Resources Information Center (ERIC), to provide links to data sets that underlie the publications stored in the repository. The officials said data access may still be limited because many Education-funded datasets are not public yet.[29]
- **FDA.** FDA officials stated that they do not know how many repositories host FDA-funded data, and an FDA-funded researcher could set up a personal website to make his/her data available. In such an instance, it is unclear how another researcher or a member of

[27]These agencies are AHRQ, DHS, DOD, Education, FDA, NSF, and VA. While VA officials reported that they do not have a web-based mechanism to help the public find data, they reported having guidance for the public on how to find or access VA-funded data.

[28]According to DHS officials, DHS has contracted with a vendor to establish a DHS data repository, and the repository is in the final stage of development and testing.

[29]ERIC is an internet-based digital library of education research and information that provides public access to bibliographic records of journal and non-journal literature from 1966 to the present. According to Education officials, the agency has awarded a contract for the planned changes to the repository. They expect work will begin in November 2019 and be completed in the third or fourth quarter of fiscal year 2020.

the public would find or access these data easily. According to FDA officials, FDA is exploring the feasibility of establishing a central database that would include links to all completed data sets associated with FDA-funded research. However, FDA officials stated that developing and maintaining a data repository to centrally store data sets would be cost prohibitive, and as a result, FDA is unlikely to store data sets centrally.

- **VA.** VA officials reported that, while a point of access for accessing clinical trials data is available at NIH's ClinicalTrials.gov, no such point of access exists for other VA-funded data due to resource constraints. VA officials stated VA is taking steps to develop a website that will provide a list of VA-funded data sets. However, VA officials said that this list will not provide a way for a member of the public to search for and access all VA-funded data.
- **NSF.** According to NSF's public access plan, the agency originally planned to modify its internal systems and the NSF website to support data searches. NSF officials said the agency has reconsidered its approach and currently plans to adopt a shared services model, which would allow it to leverage third party services such as Google Dataset Search to access NSF-funded data. However, NSF officials did not note a timeframe for implementing this approach. NSF officials also said the agency has established strategies and guidance to make it easier for the public to find and use NSF-funded data, such as focusing its efforts on building support for common metadata standards and emphasizing the importance of persistent identifiers for data.[30]

As mentioned above, agencies' public access plans must include a strategy for improving the public's ability to locate and access digital data resulting from federally funded scientific research.[31] By taking steps or

[30]In May 2019, NSF also issued guidance to researchers emphasizing the importance of using metadata and persistent identifiers and encouraged developing machine readable DMPs, which would further promote being able to find research results, according to NSF officials. In addition, officials stated that, within individual scientific disciplines, NSF-funded researchers maintain public web pages that enable the public to locate and interact with NSF-funded data.

[31]The ability to locate and access federally funded data may potentially be limited by other concerns. For example, the OSTP memo also directs agency plans to maximize public access to federally funded scientific data while (1) protecting confidentiality and personal privacy; (2) recognizing proprietary interests, business confidential information, and intellectual property rights, and avoiding significant negative impact on intellectual property rights, innovation, and U.S. competitiveness; and (3) preserving the balance between the relative value of long-term preservation and access, and the associated cost and administrative burden.

fully implementing plans to ensure that data are findable and accessible, as appropriate, these seven agencies would better support public access to federally funded data.

Most Agencies Reported Requiring Data Management Plans, but Some Have Not Evaluated the Need for, or Developed, Training or Guidance for Their Review

Progress Developing Data Management Plan Requirements

Most of the agencies we reviewed (16 of 19) reported requiring that researchers, as appropriate, submit data management plans (DMPs),[32] while three agencies reported they have not developed such requirements.

The OSTP memo states that agency public access plans must ensure that all extramural researchers receiving federal grants and contracts for scientific research and intramural researchers develop DMPs, as appropriate. These DMPs must describe how researchers will provide for the long-term preservation of, and access to, scientific data resulting from federally funded research in digital formats, or explain why these cannot be justified.

We found some instances where agencies have promulgated a single DMP policy across the entire agency and other instances where DMP policies varied within the agency. For example, according to NIH officials, NIH's various institutes and centers have issued multiple policy and guidance documents, program-specific requirements, and other documents that, collectively, establish NIH-wide DMP requirements. Table 2 provides information on agencies' reported DMP requirements.

[32]Fifteen of these 16 agencies—ACL, CDC, DOE, DOT, Education, EPA, FDA, NASA, NIH, NIST, NOAA, NSF, USDA, USGS, and VA—reported requiring DMPs for their entire research portfolio. One agency—DOD—reported requiring DMPs for at least part of its research portfolio.

Table 2: Agency-Reported Data Management Plan (DMP) Requirements as of October 2019

Agency	DMP requirement for intramural researchers	DMP requirement for extramural researchers
Administration for Community Living	na[a]	yes
Agency for Healthcare Research and Quality (AHRQ)[b]	na	na
Centers for Disease Control and Prevention	yes	yes
Department of Agriculture	yes	yes
Department of Homeland Security (DHS)[c]	na	na
Department of Defense (DOD)[d]	yes	na
Department of Education	yes	yes
Department of Energy	yes	yes
Department of Transportation	yes	yes
Department of Veterans Affairs	yes	na[a]
Environmental Protection Agency	yes	yes
Food and Drug Administration	yes	yes
National Aeronautics and Space Administration	yes	yes
National Institute of Standards and Technology	yes	yes
National Institutes of Health	yes	yes
National Oceanic and Atmospheric Administration	yes	yes
National Science Foundation	na[a]	yes
U.S. Agency for International Development (USAID)	na[a]	na[e]
U.S. Geological Survey	yes	yes

Source: GAO analysis of agency questionnaire responses, documents and comments. | GAO-20-81

[a]Agency funds only either intramural or extramural research.

[b]For intramural and extramural research, AHRQ officials reported that a draft DMP policy is under review with an anticipated effective date of January 1, 2020.

[c]For intramural and extramural researchers, DHS officials reported DHS has a draft Management Directive and Instruction under development that would establish DMP requirements.

[d]For DOD intramural researchers, there is a requirement for DMPs stated in a change to DODI 3200.12, effective December 17, 2018. According to DOD officials, the DOD components are reviewing these new requirements and are in the process of formulating guidance specific to their organizations. For extramural researchers, DOD officials reported that DOD is planning to develop DMP requirements.

[e]USAID officials reported USAID is establishing DMP requirements for extramural researchers. In the interim, some USAID operating units have started implementing their own DMP requirements specific to their particular operating unit, according to USAID officials.

Officials with four agencies reported that, due to various factors, their agencies have not yet developed or not yet fully developed DMP requirements.[33] For example, DOD officials told us DOD has not issued DMP requirements for extramural researchers because it needs to go through a more extensive regulatory process to establish them, which officials said could take a couple of years. Three agencies (AHRQ, DHS, and USAID) reported they have not established DMP requirements for either intramural or extramural research but are taking steps to establish them.[34] Without having DMP requirements for extramural and intramural researchers consistent with the OSTP memo, these agencies lack assurance that agency-funded data are being made publicly available.

Elements of DMPs across Agencies

We found some common elements which most agencies request that researchers include in their DMPs, as well as some variation based on information collected in our agency questionnaire, review of agency documentation, and interviews with agency officials. Some of the most common elements are:

- **Data description.** A description of the data or types of data to be collected or generated during the project (16 agencies).[35]
- **Long term preservation.** Plans for archiving and long term preservation of the data, or an explanation why long-term preservation and access is not justified (16 agencies).[36]

[33]These four agencies are AHRQ, DHS, DOD, and USAID.

[34]According to USAID officials, USAID has not yet established DMP requirements for extramural research and does not fund intramural research. According to USAID officials, while USAID lacks agency-wide directives requiring DMPs for all awards, USAID officials monitor the submission of data developed under its awards to USAID repositories.

[35]These agencies are ACL, CDC, DOD, DOE, DHS, DOT, Education, EPA, FDA, NIH, NIST, NOAA, NSF, USDA, USGS, and VA. In a few instances, the DMP element is applicable to only intramural researchers, or the requirement is forthcoming.

[36]These agencies are ACL, CDC, DOD, DOE, DHS, DOT, Education, EPA, FDA, NIST, NASA, NOAA, NSF, USDA, USGS, and VA. In a few instances, the DMP element is applicable to only intramural researchers, or the requirement is forthcoming.

- **Data access limitations.** A description of any circumstances that prevent all or some of the data from being made accessible (13 agencies).[37]
- **Confidential information.** Mechanisms for, or limitations to, providing access to the data including a description of provisions for the protection of privacy, confidentiality, security, intellectual property, or other rights (12 agencies).[38]
- **Roles and responsibilities.** Description of roles and responsibilities of the project staff in managing the data, including a discussion of any changes that will occur should a researcher leave the project or their institution (seven agencies).[39]

We also identified some less common DMP elements called for by various agencies. For example, according to information provided by agency officials in response to our questionnaire and agency documentation:

- Seven agencies (ACL, CDC, Education, EPA, NIH, NOAA, and USGS) request an estimate of the costs and resources to implement a researcher's DMP.
- Three agencies (CDC, Education, and NOAA) request documentation that describes the method of data collection, what the data represent, and potential limitations for use at the time the data is made available.
- Two agencies (DHS and DOE) request a rationale or justification for the proposed DMP, including, for example, the potential impact of the data within their field of study, and any broader societal impact.
- One agency (USDA) requests that researchers include information on how they plan to monitor and report on implementation of their DMP during and after the project.

We also found some instances where agencies reported varying DMP elements within their agencies. According to NSF officials, NSF's divisions have their own specific DMP elements (e.g., specific to chemistry or material science). In addition, according to NSF officials,

[37]These agencies are ACL, CDC, DHS, DOD, DOE, DOT, Education, EPA, NIH, NASA, NSF, USDA, and USGS.

[38]These agencies are ACL, CDC, DOE, DHS, DOT, Education, EPA, FDA, NIH, NSF, USDA, and VA.

[39]These agencies are CDC, DHS, Education, EPA, NOAA, USDA, and USGS.

DMP elements may also vary at the program or directorate level because NSF programs and directorates fund different research. Similarly, according to DOD officials, DMP elements for intramural researchers are different for each discipline that DOD funds. DOD officials said because DOD funds a wide range of research, from aerodynamics to zoology, the details regarding DMPs are to be worked out by the individual departments and laboratories. Further, according to NIST officials, while NIST requires DMPs for intramural research, NIST does not prescribe the way in which the preservation of researcher data must be accomplished because such requirements may not apply across all of the different scientific domains that the agency funds.

Training and Guidance on DMP Evaluation

About half of the agencies we reviewed (9 of 19) reported they have developed training or guidance to support those involved in evaluating DMPs.[40] For example:

- Department of Education officials reported they have provided training to their program officers who oversee the agency's research grant competitions to support DMP reviews.
- NASA officials stated program officers have been briefed on the need for DMPs and what is expected in them. Officials reported the agency provides templates for proposers that program officers can refer to when reviewing.
- According to DOT officials, DOT provides training to, and tools for, reviewers to assess the merits of DMPs.

Further, one agency, ACL, reported it evaluated training needs and determined training on how to evaluate the merits of researcher DMPs was not needed. According to ACL officials, ACL does not need a training program because a single subject matter expert reviews all DMPs. ACL officials stated the agency will determine in future years the model that may be best suited to ACL's workflow and available resources for the DMP review process.

However, nine of the 19 agencies reported they have not evaluated the need for, or developed training or guidance for those reviewing DMPs.[41]

[40]These agencies are CDC, DOT, Education, NASA, NIH, NIST, NOAA, NSF, and USGS.

[41]These agencies are AHRQ, DHS, DOD, DOE, EPA, FDA, USAID, USDA, and VA.

Without such training or guidance, some stakeholders and agency officials told us they believe that officials may not have the expertise needed to evaluate the merits of DMPs and, therefore, may only check whether a researcher has submitted a DMP. Specifically, 11 stakeholders characterized agencies' DMP reviews generally as an effort to check that a DMP has been created without a critical evaluation of the contents of the DMP. Some agency officials described DMP review efforts similarly to the stakeholders we interviewed. For example:

- **DOD.** According to DOD officials, while DMPs are a required component of an intramural research proposal, DOD does not mandate a merit-based review of DMPs.
- **DOE.** According to DOE officials, DOE program offices check for the presence of a DMP, but there is not a DOE-wide, uniform requirement related to how to evaluate the merits of DMPs. According to DOE officials, DMP requirements are enforced through a series of business processes that vary for each DOE sponsoring research office, but may include, for example, review criteria for the DMP. DOE officials said DMPs may be considered more important within some disciplines compared to others and as such may receive a more thorough review.
- **VA.** VA officials reported that VA checks that a researcher's proposal includes a DMP, but only conducts a high level review of the DMPs.[42] VA officials stated that training on what reviewers should look for in a DMP is uncommon and those reviewing research proposals have not commonly reviewed DMPs. In addition, VA officials said there is a need to establish standards for what constitutes the merits of a strong DMP before developing training, and officials were not aware of how widely such standards exist across other agencies.

Officials with the nine agencies that have not evaluated the need for or developed training or guidance for those involved in reviewing DMPs provided the following information to explain the status of their efforts:

- Four of the 19 agencies—AHRQ, DOD, DHS, and EPA—were awaiting completion of their agency's DMP requirements before evaluating the need for or developing training. For example, AHRQ reported it will develop training once its DMP policy is finalized and

[42]According to VA documents, DMPs are evaluated as an unscored element in the scientific peer review, and those reviewing DMPs during the review process are instructed to comment on whether the data sharing plan or the rationale for not sharing data is reasonable.

implemented. AHRQ officials reported such training would include training officials to look for the existence of a DMP and how to review DMPs. DHS officials reported once its management directives and instructions are approved, DHS will offer training to help officials identify the existence of and how to review DMPs.

- DOE does not provide training to program staff or reviewers on how to evaluate DMPs, but DOE officials reported they share insights about reviewer questions and other aspects of DMP reviews.
- FDA does not offer training or guidance for those reviewing DMPs in terms of what is expected in a DMP submission, but officials said ideally supervisors work with scientists to make sure the DMP makes sense for what is being proposed.
- VA officials reported they do not provide guidance or training for those reviewing DMPs on how to evaluate the merits of submitted DMPs. VA officials reported they only perform a check to ensure a DMP was submitted as part of a research proposal, but the DMP itself is not a part of VA's evaluation criteria when officials review the merits of a proposal.
- USAID officials reported USAID conducted an analysis that identified training needs related to data management planning, data governance and standards, locating and accessing data, and promoting a culture of data management and sharing best practices. Officials said these results are informing the design of training modules for USAID staff and other stakeholders and that USAID is currently in the process of developing relevant training modules.
- USDA officials said USDA is in the process of developing guidance for those reviewing DMPs, expected in early fiscal year 2020, to be used in training agency officials and extramural grant reviewers.

The OSTP memo directs that agencies' public access plans support training, education, and workforce development related to scientific data management, analysis, storage, preservation, and stewardship; and also ensure appropriate evaluation of the merits of submitted DMPs. Additionally, GAO's standards for internal control state that management should develop training to enable individuals to develop competencies appropriate for key roles and should tailor training to the needs of the role. Those standards also direct agencies to assess the knowledge, skills, and ability needed to obtain a workforce capable of achieving

agency goals.[43] Without evaluating the training needs of agency officials or others who review DMPs, and developing and providing training to address any gaps, agencies will lack assurance that the merits of DMPs are being evaluated.

All Agencies Established Metadata Requirements or Guidance

All 19 agencies we reviewed have established metadata requirements or guidance for researchers, for publications or data, according to responses to our questionnaire and interviews with officials. Requirements and guidance vary by agency.[44]

As we reported in December 2018, metadata provide descriptive information about other data.[45] For example, the metadata for research publications and data can include data related to author(s), dates, publication titles, and keywords. The OSTP memo states that each agency's public access plan shall ensure full public access to publications' metadata without charge upon first publication in a data format that ensures interoperability with current and future search technology.[46] Additionally, the OSTP memo states that, where possible, the metadata should provide a link to the location where the full text and associated supplemental materials will be made available after the embargo period.

[43]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014).

[44]Many of these agencies rely on NIH's PMC metadata guidance and requirements, including ACL, AHRQ, CDC, DHS, EPA, FDA, NIH, NIST, NASA, and VA. In addition, some agencies such as DOE, NIST, and NOAA reported establishing guidance or requirements that metadata be machine readable.

[45]We reported that metadata provide descriptive information about a data set in a structured format, describing aspects of the data set—such as the source of the data and when it was last updated—in clearly delineated fields. See GAO-19-72.

[46]The OSTP memo does not include a specific metadata requirement for federally funded research data. However, the OSTP memo broadly directs each agency's plan to contain an approach for optimizing search, archival, and dissemination features that encourages innovation in accessibility and interoperability, while ensuring long-term stewardship of the results of federally funded research. Additionally, specific to data, the OSTP memo directs agency plans to develop approaches for identifying and providing appropriate attribution to scientific data sets that are made available under the plan.

Agencies' metadata requirements or guidance varied in several ways:

- **Responsibility and process.** Some agencies reported placing the responsibility to develop metadata for federally funded research results on the researchers. Some help researchers develop metadata, and some rely on the publication or data repository to comply with any metadata requirements. Agencies also use different processes for reporting metadata, including manual and automated entry into a repository or website. For example, according to DOE officials, DOE developed a web-based tool that facilitates researcher metadata submission, including a function for auto-populating metadata.
- **Type and format.** Agencies reported using different metadata schema, which can lead to differences in the structure, type, and format of the metadata agencies request or require researchers to submit.
- **Use of metadata catalogues.** Some agencies, such as NIH, EPA, NOAA, USDA, and USGS, have established metadata catalogues, which are centralized mechanisms for storing and accessing different kinds of metadata. Catalogues are distinct from repositories and can help agencies and the public locate metadata for federally funded research results, according to agency officials.

Officials with six agencies stated that their agencies have plans to take additional steps to establish or enhance implementation of their metadata requirements or guidance. Specifically,

- NIST plans to automate its process of creating metadata through its Editorial Review System, which is a program through which publications are reviewed and approved prior to submission by a researcher to a publisher;
- Education plans to establish requirements that all researchers have metadata associated with their publicly accessible data sets starting in fiscal year 2020;
- CDC is in the process of implementing a web-based mechanism that will allow researchers to submit metadata records using a standard online form;
- USAID officials said the agency is working to streamline submission of digital products such as data sets and associated metadata through enterprise information technology system solutions;
- NASA is in the process of aligning its DMP requirements with its metadata guidance; and

- DOD has established metadata guidance for researchers to follow with respect to publications, and has plans to do so in the future for data.

While all agencies have established some metadata requirements or guidance, some agency officials stated that they are waiting for interagency groups that may provide guidance before developing additional metadata guidance or requirements. In addition, according to some agency officials, there are information technology challenges, including costs associated with updating aging infrastructures that are currently limited in terms of the ability to incorporate certain types of metadata.

Almost All Agencies Have Requirements or Guidance Regarding Machine Readability of Research Results

While not specifically called for by the OSTP memo, almost all agencies (18 of 19) reported establishing machine readability requirements or guidance for agency-funded research results, and these vary by agency.[47]

According to Office of Management and Budget guidance, machine readability refers to information reasonably structured to allow automated processing.[48] According to NIH officials, machine readability facilitates access to research by allowing faster, easier downloading and processing of research publications and data. Furthermore, six stakeholders we interviewed noted that providing research in a machine readable format, as well as establishing machine readability standards, would help promote access to federally funded research results by, for example, providing research in formats that can be read by computers.[49] While the

[47]Many of the agencies rely on NIH's PMC machine readability guidance and requirements for publications, including ACL, AHRQ, CDC, DHS, VA, EPA, FDA, NIST, NASA, and NIH. According to DOD officials, the agency has not established machine readability requirements or guidance for research results but plans to do so.

[48]Office of Management and Budget, *Open Data Policy – Managing Information as an Asset*, OMB Memorandum M-13-13 (Washington, D.C.: 2013). Office and Management and Budget also defines machine readability as information that is in a format in a standard computer language (not English text) that can be read automatically by a web browser or computer system. Traditional word processing documents and portable document format (PDF) files are easily read by humans but typically are difficult for machines to interpret. See OMB Circular No. A–11 (2013).

[49]Four of these stakeholders also suggested that DMPs be made machine readable (usually they are in PDF format), in order to facilitate monitoring and compliance by researchers and agency officials.

OSTP memo does not specifically mention machine readability as an element of agencies' public access plans, it does state that each agency's plan must contain an approach for optimizing search, archival, and dissemination features that encourages innovation in accessibility and interoperability.

Examples of various approaches agencies have taken in establishing machine readability requirements or guidance include:

- **Applicability.** Some agencies, such as NIST, reported establishing requirements or guidance that applies to all agency-funded research results. Other agencies' guidance or requirements focused on a subset of research results or include machine readability related to data management plans or metadata. For example, NOAA calls for submittal of machine readable metadata and citations for NOAA-funded publications stored in its repository. Also, NOAA established guidance for researchers to provide environmental data in machine readable formats.
- **Format.** Agencies reported variation in the machine readable formats they request or require. For example, USAID officials said agency guidance directs researchers to submit data and metadata in one of five machine readable formats. CDC converts publications to one machine readable format but encourages researchers to provide a variety of formats to the agency's data repository. According to USDA officials, a variety of machine readable formats are accepted for data, and where possible, data are converted into a non-proprietary, machine readable format.
- **Responsibility.** The responsibility for making federally funded research results machine readable varied by agency. In some cases, agencies assume responsibility, while in other cases, agencies place responsibility on researchers or rely on those managing a repository to do so. For example, NIST asks researchers to upload machine readable data files but converts submitted publications to a machine readable format. Similarly, according to DHS and NASA officials, the agencies rely on PMC to convert publications to a machine readable format.

While almost all agencies have established some machine readability requirements or guidance, some agencies stated that they have not prioritized further development of machine readability requirements or guidance to help increase public access to research results because no government-wide standards have been set. In addition, some agencies said that they lack the resources to implement machine readability

requirements. For example, DOD, DOE, Education, and USGS officials stated that the costs associated with implementing machine readability requirements are high, given the heterogeneity of the research and the information technology infrastructure that may be necessary. In addition, officials from some agencies we interviewed—for example, USDA and VA—stated that they rely on publishers or repositories to make research results machine readable because machine readability requirements vary from repository to repository and are domain specific. Education and USAID officials also said they rely on participating publishers to make publications machine readable.

Most Agencies Have Not Fully Implemented Mechanisms to Ensure Compliance due to Multiple Factors

Eight of 19 agencies have fully developed and implemented mechanisms to ensure compliance with their public access plans and associated requirements.[50] Table 3 provides information on the status of compliance mechanisms identified in agency questionnaire responses and interviews with agency officials.

Table 3: Status of Agency Mechanisms to Ensure Compliance with Public Access Plans and Associated Requirements

Agency	Fully developed and implemented	Partially developed and implemented	Not developed or implemented
Administration for Community Living	yes	na	na
Agency for Healthcare Research and Quality	na	na	yes
Centers for Disease Control and Prevention	yes	na	na
Department of Agriculture	na	na	yes
Department of Defense	na	na	yes
Department of Education	yes	na	na
Department of Energy	na	yes	na
Department of Homeland Security	na	na	yes
Department of Transportation	na	yes	na
Department of Veterans Affairs	na	yes	na

[50]These agencies are ACL, CDC, Education, EPA, NASA, NSF, USAID, and USGS.

Agency	Fully developed and implemented	Partially developed and implemented	Not developed or implemented
Environmental Protection Agency	yes	na	na
Food and Drug Administration	na	na	yes
National Aeronautics and Space Administration	yes	na	na
National Institute of Standards and Technology	na	yes	na
National Institutes of Health	na	yes	na
National Oceanic and Atmospheric Administration	na	yes	na
National Science Foundation	yes	na	na
U.S. Agency for International Development	yes	na	na
U.S. Geological Survey	yes	na	na

Source: GAO analysis of agency questionnaires, documents, and interviews with agency officials. | GAO-20-81

As shown in table 3, 11 agencies have not fully developed or implemented compliance mechanisms. Six of these 11 agencies have implemented a compliance mechanism that either covers only part of the research results they fund, or covers research results supported by only some of the offices within the agency.[51] For example:

- VA officials stated that they have a compliance mechanism for only their federally funded clinical trials research.
- NIH reported that the agency has fully developed and implemented a compliance mechanism for agency-funded publications. However, NIH also indicated that, while several data sharing policies and initiatives have been implemented, as of October 2019, it is in the process of developing an agency-wide data management and sharing policy, including compliance mechanisms, to fully implement its public access plan.
- NIST officials said while their compliance mechanism does not cover all of the agency's funded research, the agency plans to implement a web-based system to review and approve publications and data created by intramural researchers, which would allow the agency to confirm public access to intramural publications and data. This system would also automatically collect citation information for NIST-funded extramural research when published, allowing officials to confirm it

[51]These agencies are DOE, DOT, NIH, NIST, NOAA, and VA.

has been made publicly available. However, NIST did not identify timeframes for implementation.

- DOT officials stated that, while some of their offices lack a compliance mechanism, those offices have plans to establish compliance mechanisms, such as through upgrades to their information technology systems. However, these plans are largely tentative and DOT did not identify timeframes for implementation.
- DOE officials stated that while their compliance mechanism does not cover all of the agency's funded research, they have implemented compliance mechanisms for publications for its 17 national laboratories and intend to develop a compliance mechanism for extramural research. However, DOE did not detail a plan to develop a compliance mechanism for extramural research, and has not identified timeframes for implementation.

Agencies that have developed and implemented a compliance mechanism, or reported having partially done so, reported using some common approaches, with some variation by agency. For example:

- **Manual compliance checks.** Education officials generate monthly reports from their publications repository that list every publication submitted, and maintain a spreadsheet of awards for which public access to research results is required. The officials then review this information to ensure all listed publications and data have been made publicly available, and follow up with researchers in cases of non-compliance. According to EPA officials, EPA's intramural research managers are required to sign off that data were submitted and cross-referenced with a journal article.
- **Automated compliance mechanisms.** Some agencies reported using progress reports provided by grantees—such as Research Performance Progress Reports (RPPR)—as part of an automated compliance mechanism.[52] These reports commonly include information about steps the researcher has taken to make his/her

[52]RPPRs are standardized performance reports for awards of federal grants and cooperative agreements. The RPPR resulted from an initiative of a working group of the Social, Behavioral & Economic Research Subcommittee of the NSTC Committee on Science. Among other things, RPPRs request various types of information, including publications, data, or databases.

research publicly available.[53] According to NSF officials, when a researcher submits a publication as part of its RPPR, the publication is automatically deposited into NSF's publications repository. NSF officials stated that, as a result, researcher compliance for publications is near 100 percent.

- **Web-based tools.** Some agencies have developed web-based tools to support overseeing researcher compliance. For example, CDC and NIH officials said their agencies have systems that track when publications are made publicly available and that officials then follow up on instances of non-compliance. USGS officials stated that they use a web-based tool as a means for officials to clear or approve publications and data prior to public release and to follow up on instances of non-compliance. Multiple stakeholders we interviewed said that integrating such mechanisms with repositories can allow for better tracking and increased researcher compliance.
- **Collaboration with other agencies or nonfederal entities.** Some agencies rely on other agencies or nonfederal entities to help ensure researcher compliance. For example, according to NIH officials, NIH provides several services to agencies that use PMC, such as notifying them when publications have been uploaded into the repository, and providing metadata and machine readability capabilities for publications.[54] NIH also provides data regarding the number of publications in the repository that were funded by each agency that uses PMC, as well as the number of times the publications were accessed and any data files associated with the publication downloaded. Three stakeholders we interviewed said that NIH is a leader in terms of compliance mechanisms related to public access. Seven agencies also reported that their agreements with CHORUS enable tracking researcher compliance. According to a stakeholder we interviewed, under the agreements, CHORUS provides each agency with a public link to agency-funded publications via the

[53]Agencies that reported using RPPRs or other forms of progress reports include: ACL, CDC, DHS, DOD, DOT, Education, EPA, NASA, NIH, NIST, NOAA, NSF, USAID, and VA. However, not all of these agencies reporting using RPPRs or other forms of progress reports to track compliance.

[54]The agencies that have agreements with NIH to use PMC are ACL, AHRQ, CDC, DHS, EPA, FDA, NASA, NIST, and VA.

publisher's repository 1 year after publication.[55] Agency officials can then follow up with researchers where publications should have been made publicly available but were not.

The other five agencies have not developed or implemented any compliance mechanism as shown in table 3.[56] DHS and DOD reported requiring researchers to submit progress reports on their research, but do not use these reports as a compliance mechanism. Three of these five agencies noted that they have plans to develop and implement a compliance mechanism. Specifically, DHS officials said that they have established a DHS Public Advisory Group that manages and implements the DHS public access plan, and will develop the DHS compliance process. In addition, DOD officials described plans to establish a compliance mechanism, such as through upgrading their information technology system to serve as a mechanism to check for compliance. However, DHS' plans are tentative, and DHS and DOD have not identified timeframes for implementation. USDA officials also described plans that may include using progress reports and automated compliance mechanisms through its repository, as well as using CHORUS. USDA officials added that they have not established all of the departmental regulations or policies that would better detail its public access requirements, which is a precursor step needed before implementing compliance mechanisms.

Agency officials and stakeholders identified multiple factors limiting agency progress in establishing compliance mechanisms. For example:

- **Resource constraints.** Some agencies cited a lack of resources as a limiting factor in standing up compliance mechanisms.[57] For example, FDA officials reported that compliance mechanisms were not in place because of funding constraints.
- **Tracking and Measuring Compliance.** Some agencies are unable to measure compliance because they do not know how many publications or data sets should be made publicly available, according

[55]The seven agencies that reported having an agreement with CHORUS are DOD, DOE, NIST, NSF, USAID, USDA, and USGS. According to DOD and DOE officials, they do not use CHORUS to ensure compliance with their public access plans and related requirements.

[56]These agencies are AHRQ, DHS, DOD, FDA, and USDA.

[57]As agency officials noted, the OSTP memo requires agency plans to identify resources within the existing agency budget to implement the plan.

to officials. Knowing the number of publications and data sets resulting from agency-funded research is difficult because, according to some agency officials, some research may generate more than one publication or data set. In addition, according to NSF agency officials, tracking the number of publications and data sets is challenging as they may be published after the end of the financial assistance agreement or contract period.

- **Need for additional guidance.** Some agencies reported that they are waiting for additional leadership, for instance from interagency groups, before taking steps to develop and implement compliance mechanisms. For example, ACL and DOD officials said they are waiting to enhance or step up compliance efforts because the NSTC Subcommittee on Open Science is discussing establishing a common approach among federal agencies to track compliance with public access requirements.
- **Diverse landscape of repositories.** Some agencies and stakeholders noted that measuring compliance was a challenge given the large number of repositories used by researchers for publications and data. In order to determine compliance, agencies would have to check multiple repositories. For example, NOAA officials stated that they do not have a mechanism to discover all intramural and extramural repositories holding NOAA-funded research data.

While these factors represent challenges to agencies, some agencies we reviewed reported being able to overcome these challenges. For example, agencies such as NIH, NSF, and USGS reported that they were able to track and measure compliance by requiring researchers to regularly report on their progress and submit all research results. Finally, some agencies such as NOAA and USGS were able to mitigate the challenge of a diverse landscape of repositories by collecting metadata for research results. This way, agencies have access to the research results, regardless of the repository in which they are deposited.

Standards for internal control state that management should design and implement control activities through documented policies and procedures to respond to risks and provide reasonable assurance that agency objectives are achieved. Control activities are the policies, procedures, techniques, and mechanisms that enforce management's directives to achieve the entity's objectives and address related risks.[58] Furthermore,

[58]GAO-14-704G.

the OSTP memo states agency public access plans must include an agency strategy for measuring and, as necessary, enforcing compliance with its plan; and mechanisms to ensure that intramural and extramural researchers comply with DMPs and policies. Without mechanisms to ensure researcher compliance with agency public access requirements, agencies do not have assurance that federally funded research results are being made publicly available.

Agencies Are Coordinating on Public Access Issues but Have Not Fully Implemented Selected Leading Collaboration Practices

Agency officials reported coordinating on public access issues with other agencies as well as nonfederal entities through a variety of mechanisms. However, an interagency group—which was the primary mechanism officials identified for coordination—has not fully implemented selected leading collaboration practices to help agencies address several common challenges with public access plan implementation.

Agencies Are Coordinating on Public Access Plan Implementation

Agency officials reported coordinating on efforts to make their agencies' federally funded research results publicly available through a variety of mechanisms.[59] The OSTP memo highlights the importance of coordination, stating that federal agencies investing in research and development must have clear and coordinated policies for increasing access to federally funded research results. Additionally, the OSTP memo directs that agencies' public access plans, in coordination with other agencies and the private sector, support training, education, and workforce development related to scientific data management, analysis, storage, preservation, and stewardship.

The primary mechanism agency officials identified for coordinating on public access plan implementation is the NSTC's Subcommittee on Open

[59]Our review focused on agency coordination with external groups, such as other agencies, rather than internal agency coordination activities, though such activities may also take place. For example, the Department of Health and Human Services has undertaken an initiative to standardize data sharing activities of its component agencies.

Science (Subcommittee). According to OSTP staff, the Subcommittee is co-chaired by officials from OSTP, DOD, DOE, NIH, NOAA, and NSF. Agency officials reported coordinating through the Subcommittee on topics such as repository standards, DMP standards, public access metrics, long-term data preservation and curation, and metadata standards. According to OSTP staff, the Subcommittee is working on ways to improve public access to federally funded research results, although they did not provide details on the specific issues its workgroups are considering.

Agency officials also identified several other mechanisms they use or have used to coordinate on public access plan implementation. Specifically:

- **Coordination among agency information managers.** Some agencies reported coordinating with other agencies through an interagency group of senior scientific and technical information managers from 14 federal agencies, known as CENDI.[60] Officials described coordinating through this group to perform research on public access issues and to share best practices related to copyright, licensing, repositories, metadata, long-term preservation, and metrics, among other topics. Also, the federated search engine Science.gov, supported by CENDI, searches across agencies' publications repositories and provides links to all agencies' public access plans and submission systems.
- **Agency-to-agency coordination.** Some agency officials reported agency coordination between two agencies. For example, according to DOE officials, DOE and DOD coordinated to streamline part of their public access requirements by allowing researchers with funding from both agencies to only submit their publications once using a jointly developed interface. The submitted records would automatically be shared with both agencies, reducing administrative burdens on the researchers. A similar sharing partnership exists between DOE and NSF using different mechanisms.[61] According to NASA officials, NASA coordinated with NIH to develop NASA's publication repository. In addition, as described above, a number of agencies have an

[60]CENDI is named for its founding members and was originally an acronym for Commerce, Energy, NASA, Defense Information Managers Group. According to NASA officials, it no longer spells out the acronym.

[61]According to DOD and NSF officials, DOE's PAGES software provides the platform for both DOD's and NSF's publication repository.

agreement with NIH to use PMC as the repository for publications submitted by their researchers. This has saved resources, according to officials from several agencies. NIH and NSF also reported holding workshops to promote public access to federally funded research results. According to USAID officials, if another federal agency is providing the majority of funding for a research project for which USAID is also providing funding, USAID allows researchers to generally follow the public access requirements of the other federal agency, thus reducing the administrative burden on researchers.

- **Coordination with nonfederal entities.** Officials with several agencies reported using different mechanisms to coordinate with nonfederal entities. For example, NIH reported establishing agreements with several thousand journals to automatically deposit publications into PMC so researchers do not have to manually upload these themselves.[62] CDC and NSF officials reported coordinating with Google to improve the metadata or findability, respectively, of publications in the agencies' repositories to make them easier to find. Some agencies reported entering into an agreement with the publisher consortium CHORUS to link to the publisher's final version of record for publications. NOAA officials said that they are making NOAA data accessible through the use of public-private partnerships, where many of NOAA's most popular open data sets and research results are available to the public at no cost.

The NSTC Subcommittee on Open Science Has Not Fully Implemented Selected Leading Collaboration Practices

The NSTC Subcommittee on Open Science provides a forum for agency officials to coordinate on public access, but the Subcommittee has not fully implemented selected leading interagency collaboration practices to help agencies address several common public access plan implementation challenges.[63]

[62]According to NIH's public access plan, PMC is operated in partnership with private sector publishers. Approximately 2,500 journals plus 40 publisher programs (which deposit 5,000 journals) have agreements with the National Library of Medicine to submit content to PMC on behalf of NIH-funded researchers.

[63]GAO has broadly defined collaboration as any joint activity that is intended to produce more public value than could be produced when the organizations act alone. GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

As we previously reported, interagency collaborative mechanisms can take many different forms, and incorporating leading practices we have identified into agencies' collaborative efforts can help reduce or better manage potential fragmentation, overlap, and duplication of federal programs.[64] In our April 2015 guide to evaluating and managing fragmentation, overlap and duplication, we define fragmentation as a situation where more than one federal agency, or organization within an agency, is involved in the same broad area of national need, and where opportunities exist to improve service delivery.[65] In this context, the definition of fragmentation applies to agencies' individual efforts to implement public access plans. While this stems from the research and development activities each agency supports and which differ in meaningful ways, applying the leading practices we have identified to interagency collaborative mechanisms can help to leverage public access efforts across agencies. As the primary mechanism that agency officials identified for coordination on public access plan implementation, the Subcommittee is positioned to help manage fragmentation and ensure efficient collaboration. Accordingly, the Subcommittee co-chairs have taken steps to begin working with the other participating agencies to outline priorities and areas of focus for the Subcommittee and its workgroups.

Despite these efforts, some agency officials and stakeholders identified areas in which coordination has not yet fully addressed common challenges to implementing public access plans. Some of these challenges align with topics on which agency officials reported coordinating through the Subcommittee. For example:

- **Absence of common standards.** As described above, agency officials identified several areas where the absence of common standards makes it more difficult to implement public access plans. Such areas include:
  - **Repository standards.** A number of agency officials said the issue of how long repositories should store and make data publicly

[64]GAO, *Fragmentation, Overlap, and Duplication: An Evaluation and Management Guide*, GAO-15-49SP (Washington, D.C.: Apr. 14, 2015). GAO-15-49SP defines overlap as when multiple agencies or programs have similar goals, engage in similar activities or strategies to achieve them, or target similar beneficiaries. GAO-15-49SP defines duplication as instances when two or more agencies or programs are engaged in the same activities or provide the same services to the same beneficiaries.

[65]GAO-15-49SP.

available remains a challenge. For example, they said agencies are still trying to determine how to balance the relative value of storing and making data publicly available with the costs of curating such data over the long term. In addition, eight stakeholders we interviewed noted that most agencies have not established repository standards for long-term preservation, and they underscored the importance of doing so to ensure ongoing access to federally funded research results.

- **DMP standards.** Officials with some agencies described DMPs as a new requirement within the last few years and agencies are still learning how to integrate them with other efforts to provide public access. Some said that developing common DMP standards across agencies would help them in establishing DMP requirements for the researchers they fund.
- **Metadata and machine readability standards.** Officials at some agencies said they are uncertain of the type and extent of metadata and machine readability standards that should be used with agency-funded research results and associated information technology systems. For example, officials from some agencies said they are waiting for machine readability standards from the Subcommittee before taking additional steps to develop machine readability requirements or guidance. Further, while some agencies have developed metadata and machine readability requirements or guidance as described above, without agreement across agencies on minimum standards, agencies' requirements or guidance vary. Several stakeholders we interviewed noted that standardizing baseline requirements could increase access to federally funded research results.

- **Measures of effectiveness.** Officials at some agencies said that measuring the effectiveness of public access plan implementation is a challenge. Some agencies reported using a range of metrics such as the number of publication downloads or the number of unique visitors to their websites. However, agency officials acknowledged that this is an imperfect measure for effectiveness. A number of agency officials we interviewed expressed interest in learning more about how other agencies are successfully addressing the challenge of measuring the effectiveness of public access plan implementation.
- **Compliance mechanisms.** A number of agencies reported that developing mechanisms to ensure compliance with public access requirements has been a challenge, in part, because they are unsure about whether a common approach to tracking compliance will be agreed upon by agencies participating in the Subcommittee.

- **Balancing sensitive information with public access.** Some agencies and many stakeholders identified the challenge of balancing providing public access with safeguarding national security and personally identifiable information.[66] Education officials, for example, reported that because data involved in department-funded research are subject to regulations that govern personally identifiable information, the agency cannot make it available to the public without a restricted-use license. Furthermore, agencies funding medical research are concerned about public access to individuals' medical information.

However, the Subcommittee has not fully implemented selected leading practices that can enhance and sustain interagency collaboration. Specifically, we evaluated the Subcommittee's efforts to implement the following three leading practices:

- **Defining and articulating common outcomes.** We have reported that effective collaboration requires agencies to define and articulate common outcomes or purposes they are seeking to achieve.[67] OSTP staff said that the Subcommittee does not have a charter, and instead OSTP chartered work at the committee level of which the Subcommittee is a component. In addition, according to a document provided by OSTP staff, NSTC and OSTP will set the Subcommittee's general priorities and outcomes and—in collaboration with member agencies—will establish specific, tangible outputs and deliverables to advance priorities. However, the document provided does not specify common outcomes or purposes that the Subcommittee is seeking to achieve, and instead provides general descriptions of the Subcommittee process.
- **Agreeing on roles and responsibilities.** We have reported that collaborating agencies should agree on roles and responsibilities to better clarify who will do what, organize their joint and individual

[66]In some cases, agencies have taken steps to address this common challenge. For example, ACL reported the data repository the agency has identified for making its research data sets available has the means to protect confidentiality and personal privacy, as well as recognize proprietary interests, business confidential information, and intellectual property rights. USAID has implemented procedures for protecting confidentiality and personal privacy, as well as recognizing proprietary interests and intellectual property rights, through the agency's central data repository. In addition, according to USAID officials, USAID's standard award provisions require partners to ensure that any data set submitted to its data repository does not contain any proprietary or personally identifiable information.

[67]GAO-06-15.

efforts, and facilitate decision making. According to OSTP staff, Subcommittee member agencies meet monthly to discuss the Subcommittee's work, and six workgroups have been established to focus on public access plan implementation. OSTP staff characterized the Subcommittee's and its workgroups' efforts as a means to identify and share best practices and to help agencies address public access plan implementation challenges. Indeed, officials with many of the agencies in our review indicated that they are looking toward the Subcommittee as a source of guidance on public access issues. However, the Subcommittee has not publicly provided details of the activities of the six workgroups. OSTP staff provided us with a document generally describing Subcommittee processes for conducting work, such as collaborating to identify strengths and weaknesses of existing federal agency policies. However, OSTP staff said they could not yet specifically describe the roles and responsibilities for agencies on the Subcommittee, including the composition or roles and responsibilities of agencies in its workgroups, citing the deliberative nature of the Subcommittee's work.

- **Developing mechanisms to monitor, evaluate, and report on results.** We have reported that collaborating agencies should create the means to monitor, evaluate, and report on results from collaborative efforts to enable agencies to identify areas for improvement. OSTP staff said that the Subcommittee has drafted a report on federal open science policies that can further enhance access to federally funded research results and which is under review, but has not yet been finalized.

According to OSTP staff and documents, the Subcommittee is operating consistent with processes and procedures of other NSTC subcommittees. They characterized much of what the Subcommittee is working on or what it might aim to accomplish as deliberative. While the existence of the Subcommittee and its workgroups indicate interagency collaboration on public access plan implementation, we were unable to determine the extent to which selected leading collaboration practices have been implemented by the Subcommittee and its member agencies. By taking steps to fully implement the relevant leading practices we have identified, the Subcommittee and its member agencies could better marshal their collective efforts to address common public access plan implementation challenges that agency officials and stakeholders identified.

Conclusions

Providing public access to federally funded research results—publications and data—stemming from the billions of dollars that agencies spend on research each year could accelerate scientific and technological advances, thereby helping to make the nation and its people more prosperous and secure. Following a 2013 OSTP memo that called for certain agencies to develop plans to support increased public access to federally funded research results, many agencies have taken steps to implement their plans. For example, all agencies we reviewed have identified repositories for storing publications and making them publicly available.

However, we identified several areas where agencies we reviewed have made less progress implementing their public access plans—largely in developing and implementing requirements to support public access to research data. Specifically,

- Twelve agencies have taken steps to increase the ability to find the data developed by researchers they fund—for instance by providing a way for the public to readily locate and access data that may reside in any number of federal and nonfederal repositories. However, seven agencies have not taken such steps. By taking steps to ensure that research data can be found easily, these agencies can better support public access to such data.
- Sixteen agencies reported requiring that researchers submit DMPs for at least part of their research portfolio. DMPs are supposed to describe how researchers will provide for the long-term preservation of and access to data, or a justification for why that cannot be done. However, four agencies reported they have not developed such a requirement or have done so on a limited basis. Without developing DMP requirements, agencies lack assurance that agency-funded research data are being made publicly available.
- Nine agencies reported they have not evaluated the need for, or developed training or guidance, for those reviewing DMPs. Without taking these steps, agencies will lack assurance that agency officials or others who review DMPs have the expertise needed to evaluate their merits.

In addition to these research data-specific issues, we identified two broader issues: compliance mechanisms and coordination. First, while eight agencies have developed and fully implemented mechanisms to

ensure compliance with their public access plans and associated requirements, 11 of the agencies we reviewed reported that they have not done so in whole or in part. Without fully developing such mechanisms, agencies do not have assurance that researchers are following through with making their federally funded research results publicly available.

Second, while agencies have coordinated on public access issues, these efforts have not yet fully addressed common public access plan implementation challenges, according to agency officials and stakeholders. Moreover, the six agencies that co-chair the primary interagency group officials identified for coordinating on public access issues have not fully implemented selected leading collaboration practices that can help agencies enhance and sustain their collaborative efforts, including defining and articulating common outcomes; agreeing on roles and responsibilities; and developing mechanisms to monitor, evaluate, and report on results. By taking such steps, agencies could better marshal their collective efforts to make federally-funded research results as widely available as possible.

Recommendations for Executive Action

We are making a total of 37 recommendations to 16 agencies: five to DOD, four to AHRQ, four to DHS, three to DOE, three to FDA, three to VA, two to NIH, two to NOAA, two to NSF, two to USAID, two to USDA, one to DOT, one to Education, one to EPA, one to NIST, and one to OSTP. Specifically:

- The Secretary of Defense should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 1)
- The Secretary of Education should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 2)
- The Director of the Agency for Healthcare Research and Quality should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 3)
- The Commissioner of the Food and Drug Administration should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 4)

- The Secretary of Homeland Security should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 5)
- The Secretary of Veterans Affairs should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 6)
- The Director of the National Science Foundation should fully implement plans to ensure appropriate agency-funded research data are readily findable and accessible to the public. (Recommendation 7)
- The Secretary of Defense should complete development of data management plan requirements for extramural researchers. (Recommendation 8)
- The Director of the Agency for Healthcare Research and Quality should complete development of data management plan requirements. (Recommendation 9)
- The Secretary of Homeland Security should complete development of data management plan requirements. (Recommendation 10)
- The U.S. Agency for International Development Administrator should complete development of data management plan requirements for extramural researchers. (Recommendation 11)
- The Secretary of Agriculture should complete development of guidance and provide training to agency officials or others involved in reviewing the merits of researchers' data management plans. (Recommendation 12)
- The U.S. Agency for International Development Administrator should complete development of and provide training for agency officials or others involved in reviewing the merits of researchers' data management plans. (Recommendation 13)
- The Commissioner of the Food and Drug Administration should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 14)
- The Secretary of Homeland Security should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 15)

- The Secretary of Veterans Affairs should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 16)
- The Director of the Agency for Healthcare Research and Quality should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 17)
- The Secretary of Defense should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 18)
- The Secretary of Energy should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 19)
- The Environmental Protection Agency Administrator should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and, if additional training is found to be warranted, develop and provide such training. (Recommendation 20)
- The Secretary of Agriculture should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 21)
- The Secretary of Defense should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 22)
- The Director of the Agency for Healthcare Research and Quality should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements.(Recommendation 23)
- The Commissioner of the Food and Drug Administration should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 24)
- The Director of the National Institutes of Health should fully develop and implement a mechanism to ensure researcher compliance with

the public access plan and associated requirements. (Recommendation 25)

- The Secretary of Homeland Security should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 26)
- The National Oceanic and Atmospheric Administration Administrator should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 27)
- The Secretary of Energy should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 28)
- The Secretary of Veterans Affairs should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 29)
- The Secretary of Transportation should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 30)
- The National Institute of Standards and Technology Director should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. (Recommendation 31)
- As the Subcommittee on Open Science moves forward, the Office of Science and Technology Policy co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 32)
- As the Subcommittee on Open Science moves forward, the Department of Defense co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 33)
- As the Subcommittee on Open Science moves forward, the Department of Energy co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 34)
- As the Subcommittee on Open Science moves forward, the National Institutes of Health co-chair, in coordination with other co-chairs and

participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 35)

- As the Subcommittee on Open Science moves forward, the National Oceanic and Atmospheric Administration co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 36)
- As the Subcommittee on Open Science moves forward, the National Science Foundation co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration. (Recommendation 37)

Agency Comments and Our Evaluation

We provided a draft of this report to the Department of Commerce (for NIST and NOAA), DHS, DOD, DOE, the Department of the Interior (for USGS), DOT, Education, EPA, HHS (for ACL, AHRQ, CDC, FDA, and NIH), NASA, NSF, OSTP, USAID, USDA, and VA for review and comment. Commerce, DHS, DOD, DOE, DOT, Education, EPA, HHS, NSF, USAID, USDA, and VA provided written responses in which they generally concurred with our recommendations. The agencies' written responses are reproduced in appendix III to XIV, respectively. OSTP disagreed with our recommendation directed to it as discussed below.

In expressing concurrence with the recommendations directed to them, agencies' written comments also included discussion of aspects of their public access plan implementation activities we examined in our report, or the agencies' planned actions to implement our recommendations. Some agencies also provided more specific comments regarding certain recommendations directed to them.

In its written comments, DOD concurred with 4 of our recommendations and partially concurred with one—the recommendation to take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public. DOD comments on this recommendation described challenges associated with balancing sensitive information with public access. Specifically, DOD noted that the release of data requires specific subject matter expertise, understanding of operational security issues and potential misuse of data, and the possibility of revealing national security vulnerabilities through the aggregation of datasets. DOD stated it is researching methodologies to address aggregation of

unclassified datasets and that it will issue guidance once an acceptable methodology is developed.

As discussed in our report, balancing these considerations is a challenge that agency officials and stakeholders identified during our work. Accordingly, our recommendation to DOD and certain other agencies regarding findability and accessibility of agency-funded research data was qualified to pertain to appropriate agency-funded research data—recognizing that it might not be appropriate to make certain datasets publically available because of national security or other concerns. As a result, we did not make any adjustments to the report in response to DOD's comment.

VA's written comments noted that it concurred with all three of our recommendations. However, with regard to the recommendations that VA take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public, and that VA fully develop and implement a mechanism to ensure researcher compliance with its public access plan and associated requirements, VA's comments indicated that it has already completed actions to implement the recommendations. For the recommendation concerning findability and accessibility of research data, VA described how its efforts have focused on ensuring that over 16,000 VA-funded publications have been included in PMC, and that summary data from all VA-funded clinical trials research are submitted to clinicaltrials.gov. VA also referenced working through its intra-agency Data Governance Council as a means to help VA achieve public access goals.

As we state in our report, while VA is making clinical trials data available through clinicaltrials.gov, VA funding supports development of other types of research data beyond clinical trials data. While VA officials stated the agency has begun developing a website to help ensure the findability and accessibility of non-clinical trials datasets, the officials did not provide us with any timelines or milestones for this effort. Similarly, concerning the recommendation to fully develop and implement a mechanism to ensure researcher compliance, VA stated that it has established such mechanisms, including requirements for providing DMPs and registration of funded clinical trials in clinicaltrials.gov. However, as we describe in this report, VA's compliance mechanism covering VA-funded clinical trials research would not cover other research data the agency funds. VA did not provide information on compliance mechanisms covering other types of agency-funded research data during the course of our review. Therefore, we did not adjust the information or recommendations in our report in response to VA's comments.

NIH's written comments indicated that it concurred with our recommendation to fully develop and implement a mechanism to ensure research compliance with the public access plan and associated

requirements. However, NIH stated that, for publications, it has fully developed and implemented mechanisms to ensure researcher compliance. Regarding data, NIH stated that the agency has several data-sharing policies and initiatives for which compliance mechanisms are in place. The agency said it is focusing its efforts on drafting an agency-wide data management and sharing policy and associated guidance that will fully implement its public access plan, including mechanisms to ensure research compliance. NIH suggested that the recommendation be revised to reflect that NIH has a long-standing, fully developed compliance program for its public access policy for publications and is in the process of developing a policy that will fully implement its public access plan for data. We believe our recommendation, as worded, appropriately reflects the extent to which NIH has implemented researcher compliance mechanisms as of November 2019. However, based on NIH's comments, we added information in the report to clarify that NIH has compliance mechanisms for publications but is still developing such mechanisms for data.

For EPA, the draft report we provided for comment had three proposed recommendations to the agency. In addition to recommending that EPA evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs, we also proposed recommending that EPA complete development of DMP requirements for extramural researchers and that EPA fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. These latter two recommendations were developed based on the information EPA provided during the course of our review, which indicated that EPA had not developed DMP requirements for extramural researchers or fully developed and implemented compliance mechanisms.

EPA indicated in its written comments that it concurred with all three of our proposed recommendations. However, EPA stated that it had already taken action to implement the two additional recommendations described above by issuing an EPA order on September 26, 2019, the day before we transmitted the draft for agency comment. After reviewing the EPA order, we agree that it implements our originally-proposed recommendations by requiring extramural researchers to submit DMPs, and by instituting a mechanism to ensure extramural researcher compliance with EPA's public access plan and associated requirements. Based on EPA's comments and our review of the order, we made several changes to our report to indicate that EPA has fully developed and implemented DMP requirements and compliance mechanisms for both

intramural and extramural researchers, and we removed the two proposed recommendations to EPA related to these issues.

OSTP's Senior Legal Counsel provided OSTP's comments via email. In its comments, OSTP stated that it disagreed with our recommendation that OSTP, in coordination with other co-chairs and participating agencies on the Subcommittee on Open Science, take steps to fully implement leading practices that enhance and sustain collaboration. With respect to the leading practice on defining and articulating common outcomes, OSTP commented that it had identified key outcomes with the Subcommittee but did not indicate in its comments or in our prior discussions with OSTP staff what those key outcomes are. As we state in our report, while OSTP had developed a charter at the committee level for which the Subcommittee is a component, the Subcommittee itself does not have a charter. Moreover, in our report we state that OSTP had provided a document stating that NSTC and OSTP will set the Subcommittee's general priorities and outcomes, as well as establish specific, tangible outputs to advance priorities. However, OSTP did not provide any documentation specifying common outcomes or purposes the Subcommittee is seeking to achieve.

With respect to the leading practice on agreeing on roles and responsibilities, OSTP commented that it had agreed on roles and responsibilities with the Subcommittee, adding that OSTP and the Subcommittee had carefully selected agency representatives with relevant expertise to sit on the Subcommittee's steering committee, as well as to lead specific working groups consistent with their expertise. In our report we recognize that Subcommittee member agencies meet monthly to discuss Subcommittee work, and six working groups have been established to focus on public access plan implementation. However, as we describe in this report, OSTP did not provide any documents that detail the activities of the six working groups, and in its comments OSTP did not provide any substantive information about the roles and responsibilities of those involved in the working groups.

With respect to the leading practice on developing mechanisms to monitor, evaluate, and report on results, OSTP commented that the Subcommittee work products and progress are reviewed on an annual basis by NSTC leadership and also by Subcommittee leadership on a monthly basis. In addition, OSTP stated that working groups are asked to report on the status of their deliverables, and that such deliverables are reviewed by Subcommittee leadership, where final products are evaluated. The products are communicated to NSTC leadership for final

review and approval, and a determination is made as to what work products can be made available to the public. During the course of our review, OSTP staff did not provide any Subcommittee work products from any of the six working groups, and as of November 2019 OSTP has not finalized or made public a report on federal open science policies that can further enhance access to federally funded research results, or any other work products stemming from the Subcommittee.

As we state in this report, OSTP staff characterized much of what the Subcommittee is working on as being deliberative. While the actions described by OSTP indicate progress toward implementing the identified leading practices, OSTP did not provide evidence to support the actions it said it had taken. Therefore, we did not adjust the information or recommendation in our report in response to OSTP's comments.

In addition, Education, NIH, NIST, NSF, and USAID provided technical comments, which we incorporated as appropriate. Officials from Interior and NASA stated via email that they had no comments on the report.

We are sending copies of this report to the appropriate congressional committees; the Secretaries of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, the Interior, Transportation, and Veterans Affairs; the Director of the National Science Foundation; the Administrator of the Environmental Protection Agency; the Administrator of the National Aeronautics and Space Administration; the Administrator of the U.S. Agency for International Development; the Director of the Office of Science and Technology Policy; and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-6888 or neumannj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix XV.

John Neumann
Managing Director, Science, Technology
Assessment, and Analytics

Appendix I: Objectives, Scope, and Methodology

This report examines the extent to which agencies (1) have made progress in implementing plans to increase public access to federally funded research results, and (2) are coordinating on public access plan implementation. In this report, we define federally funded research results as publications and data arising from federally funded intramural or extramural research, as identified in the Office of Science and Technology Policy's (OSTP) 2013 memorandum, *Increasing Access to the Results of Federally Funded Scientific Research*.[1]

The scope of our review included 19 federal agencies.[2] As stated above, the OSTP memo applies to federal agencies with over $100 million in annual research and development expenditures. Accordingly, to determine the agencies in our scope, we took several steps, including (1) identifying agencies with over $100 million in annual research and development expenditures by examining data published by the National

[1]Office of Science and Technology Policy, *Increasing Access to the Results of Federally Funded Scientific Research*, Memorandum (Washington, D.C.: Feb. 22, 2013). The OSTP memo defines publications as those published in peer-reviewed scholarly publications that are based on research directly arising from federal funds. In this report, we refer to peer-reviewed manuscripts, research papers, or scholarly publications as publications unless otherwise specified. The OSTP memo defines data as the digital recorded factual material commonly accepted in the scientific community as necessary to validate research findings, including data sets used to support scholarly publications, but does not include laboratory notebooks, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as laboratory specimens.

[2]As the OSTP memo does not define "agency", for the purposes of this report, we define an agency as a cabinet-level department, agency, or subcomponent thereof, including, but not limited to, an office, institute, or center, unless otherwise specified. Some agencies created a public access plan applying broadly to all subcomponent agencies within the agency. In other cases, agencies' subcomponent agencies developed their own public access plans. Given different organizational structures within each of the agencies we selected for review, we relied on each agency to identify the appropriate subcomponent agencies and officials to provide information in response to our requests.

Science Foundation (NSF) on such expenditures as of October 2016,[3] (2) identifying agencies that developed a public access plan, and (3) confirming with agency officials that their agency is subject to the OSTP memo.[4] Based on this analysis, we identified 21 agencies. We excluded the following two upon further review:

- According to Smithsonian officials, the Smithsonian Institution receives federal appropriations to conduct research and elected to develop a public access plan using the OSTP memo as guidance. However, we excluded the Smithsonian because, according to Smithsonian officials and their public access plan, policy mandates issued by OSTP on behalf of the executive branch do not legally apply to the Smithsonian Institution.
- The Office of the Assistant Secretary for Preparedness and Response within the Department of Health and Human Services developed a public access plan. However, during the course of our review, agency officials reported the agency had determined it was not subject to the OSTP memo because its exempted classified and national-security-related research brought its total research and development expenditures under the $100 million annual threshold. Thus, agency officials reported the agency was not implementing its public access plan. Accordingly, we excluded the Office of the Assistant Secretary for Preparedness and Response from our review.

The 19 federal agencies in our scope were:

- Seven cabinet-level departments: the Departments of Agriculture (USDA), Defense (DOD), Education (Education), Energy (DOE), Homeland Security (DHS), Transportation (DOT), and Veterans Affairs (VA)
- Five subcomponent agencies within the Department of Health and Human Services: the Administration for Community Living (ACL),

[3]National Science Foundation, National Center for Science and Engineering Statistics, *Survey of Federal Funds for Research and Development*, *Fiscal Years 2015-2017* (April 2017). NSF data include expenditures for basic research, applied research, and development. For purposes of this report, we generally refer to these as research expenditures. We determined that the NSF expenditure data were sufficiently reliable for initially identifying the agencies that were likely subject to the OSTP memo according to research and development expenditure levels.

[4]GAO did not determine which agencies were subject to the OSTP memo, instead GAO accepted each agency's interpretation regarding whether they were subject to the OSTP memo.

Agency for Healthcare Research and Quality (AHRQ), Centers for Disease Control and Prevention (CDC), Food and Drug Administration (FDA), and National Institutes of Health (NIH)

- Two subcomponent agencies within the Department of Commerce: the National Institute of Standards and Technology (NIST), and National Oceanic and Atmospheric Administration (NOAA)
- One subcomponent agency with the Department of the Interior: the U.S. Geological Survey (USGS)
- Four independent agencies: the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the U.S. Agency for International Development (USAID)

To collect information for both of our objectives, we developed and administered a questionnaire for the 19 agencies that included questions regarding steps agencies have taken to meet the directives outlined in the OSTP memo and challenges they may have faced, among other topics. Our questionnaire included both open- and close-ended questions related to implementation of public access plans; publication and data repositories; web-based mechanisms for providing public access to publications and data, and metrics on the use of these mechanisms; data management plans (DMP) and standards; resources for implementing public access plans; agency compliance mechanisms, as well as researcher compliance with agencies' public access requirements; coordination with federal agencies and other stakeholders; and training.

We took steps in developing the questionnaire, collecting the data, and analyzing the responses to ensure the quality of information collected. For example, we pre-tested the draft questionnaire with officials from two agencies in our review to ensure that the questions were relevant, clearly stated, and easy to understand. We made changes to the content and format of the questionnaire after the pre-tests, based on the feedback we received. We received completed questionnaires from all 19 agencies.

For open-ended questions, we performed a content analysis and developed summaries of agency responses, grouping together similar agency responses to develop high level themes and counts. An independent analyst confirmed the summaries and summary statements were accurate based on a review of the information provided from the agency questionnaire responses. In instances where an answer from an agency was not clear, we followed up directly with agency officials to obtain additional clarification on the agency's questionnaire response. For

closed-ended or binary questions (e.g., yes or no responses), we aggregated agency questionnaire responses and developed summary statistics.

To answer both objectives, we also obtained and reviewed agency documents, including agencies' public access plans, as well as documents identified by agency officials as pertinent to implementing their public access plans, such as any policies, procedures, regulations, guidance, manuals, contracts, example financial assistance agreements and contracts, memorandums of understanding, and performance reports.

In addition, we interviewed officials from a nonprobability sample of 11 of the 19 agencies in our scope to clarify questionnaire responses; develop illustrative examples of how some agencies are implementing their public access plans; and gather additional information on public access plan implementation, for instance, on challenges agencies are facing implementing their plans. We selected these agencies based on the following considerations to achieve a diverse cross-section of agencies: amount of research and development expenditures; types of repositories agencies reported using to store publications and data; types of research funded; and extent of public access plan implementation. First, we ranked agencies based on NSF research and development expenditure data for fiscal year 2015, which was the most recent data available at the time we took our sample. For the research and development expenditures, we categorized agencies exceeding the OSTP memo's $100 million annual expenditure threshold into large, medium, and small annual expenditure levels and used a combination of random and judgmental sampling to select four agencies with large expenditure levels (DOE, NIH, NSF, and USDA), four with medium expenditure levels (DOD, NIST, USGS, and VA), and two (FDA and USAID) with small expenditure levels from our universe of 19 agencies.[5] We interviewed officials with an eleventh agency (EPA) based on the previously identified criteria and other contributing factors. While the results cannot be projected to all 19 agencies we reviewed, these represent a mix of agencies, based on our selection criteria.

[5]We defined an agency with annual research and development expenditures greater than $1 billion as large; an agency with annual research and development expenditures between $500 million and $1 billion as medium; and an agency with annual research and development expenditures less than $500 million as small.

We also interviewed OSTP staff to gather their perspectives on agency progress, challenges, and coordination related to public access plan implementation. We reviewed available OSTP-related documentation, including charters and reports, to better understand OSTP's role and responsibilities as they relate to public access to federally funded research results. However, the documentation we obtained and reviewed pertaining to the efforts of an OSTP co-led interagency group was limited as, according to OSTP staff, much of its efforts are deliberative.

Finally, to collect information for both of our objectives, we conducted interviews with a nonprobability sample of 21 nonfederal stakeholder organizations. The stakeholder organizations we interviewed included the following:

- American Association for the Advancement of Science,
- American Association of Publishers,
- Association of American Universities,
- Association of College and Research Libraries,
- American Geophysical Union,
- Association of Public and Land Grant Universities,
- California Digital Library of the University of California,
- Center for Open Science,
- CHORUS (a publisher consortium),
- Elsevier,
- Google,
- Harvard Open Access Project,
- Institute of Electrical and Electronics Engineers,
- National Data Service,
- National Information Standards Organization,
- Open Access Scholarly Publishers Association,
- Public Library of Science,
- Research Data Alliance,
- Sloan Foundation,
- Scholarly Publishing and Academic Resources Coalition, and

- Virginia Polytechnic Institute and State University (Libraries).

We identified these 21 stakeholder organizations through a search of relevant literature and documents, background interviews with agency officials and others, news and media articles, and the "snowball sampling" technique.[6] Through the latter method, representatives of each stakeholder organization were asked to propose or recommend additional stakeholders for GAO to interview. Once we developed a robust list of stakeholder organizations, we took several steps to judgmentally select stakeholder organizations for interviews. First, we sorted the list of stakeholders by organization type (e.g., nonprofit, publisher, academic, professional association, advocacy group, data community, etc.) to ensure we interviewed organizations that could provide broad and diverse perspectives on issues related to public access and to ensure variety across the selected organizations. Second, within each type of stakeholder organization, we considered a number of selection criteria, including (1) the general domain or discipline of the organization (e.g., biology, agriculture, engineering, etc., according to our review of organization websites or other information); (2) the diversity of perspectives on public access issues (as identified in public literature, web information, and/or background interviews); (3) referrals and recommendations received from one or more other individuals or groups; (4) whether the organization was a part of the National Academies of Sciences, Engineering, and Medicine and National Research Council public comment meetings on public access to federally funded research;[7] and (5) independent research.

We asked the stakeholders their views on agency public access plan implementation and any implementation challenges, along with options to address identified challenges; coordination between agencies and with nonfederal organizations; DMPs; compliance issues; public access metrics; implementation costs; and training. We conducted a content analysis of information obtained from the stakeholder semi-structured interviews in order to identify common themes, developing summary

[6]In snowball sampling, the methodology begins with an initial list of contacts, and asks each person interviewed to refer the interviewer to additional cognizant persons. The group of referred contacts (or "snowball") grows larger and then narrows as a group of individuals are identified frequently.

[7]The meetings were held in May 2013 and involved presentations from representatives from academia, nonprofit organizations, and members of the public.

statements. The views of stakeholders we interviewed cannot be generalized to other stakeholder organizations.

To evaluate agencies' progress in implementing public access plans, we compared agencies' efforts to the directives specified in the OSTP memo, and to federal standards for internal control, as appropriate.[8] To evaluate interagency coordination on public access plan implementation, we reviewed agency coordination efforts identified in our interviews and also compared the efforts of an OSTP co-led interagency group to the OSTP memo and to selected leading practices for enhancing and sustaining collaboration identified in an October 2005 GAO report.[9] We selected three of the eight practices based on their relevance to the operations of the interagency coordination efforts we identified.[10] These three practices included defining and articulating common outcomes; agreeing on roles and responsibilities; and developing mechanisms to monitor, evaluate, and report on results. In this report, and in our past work, we define collaboration broadly as any joint activity that is intended to produce more public value than could be produced when organizations act alone.[11] Through interviews and information requests, we asked agency officials and OSTP staff to provide information on their efforts to coordinate on public access plan implementation.

We conducted this performance audit from November 2017 to November 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[8]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014). We did not include the Foundations for Evidence-Based Policymaking Act of 2018 in our review as the law was passed toward the end of our audit and is still being implemented.

[9]GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

[10]We excluded from our review five leading practices related to reinforcing agency accountability; individual accountability for collaborative efforts; establishing mutually reinforcing or joint strategies; identifying and addressing needs by leveraging resources; and establishing compatible policies, procedures, and other means to operate across agency boundaries.

[11]We also refer to coordination as collaboration in our work.

Appendix II: Repositories for Agency-Funded Publications

Table 4: Agency-Identified Repositories for Agency-Funded Publications

Agency	Primary publications repository	Public access website(s)
Administration for Community Living	PubMed Central (PMC)	https://www.ncbi.nlm.nih.gov/pmc/
Agency for Healthcare Research and Quality	PMC	https://www.ncbi.nlm.nih.gov/pmc/
Centers for Disease Control and Prevention (CDC)	PMC[a]	https://www.ncbi.nlm.nih.gov/pmc/
Department of Agriculture	PubAg[b]	https://pubag.nal.usda.gov
Department of Defense	PubDefense	https://publicaccess.dtic.mil
Department of Education	Education Resources Information Center (ERIC)	https://eric.ed.gov/
Department of Energy	Department of Energy Public Access Gateway for Energy & Science (DOE PAGES)	https://www.osti.gov/pages
Department of Homeland Security	PMC	https://www.ncbi.nlm.nih.gov/pmc/
Department of Transportation (DOT)	Repository and Open Science Access Portal (ROSA-P)[c]	https://rosap.ntl.bts.gov/
Department of Veterans Affairs	PMC	https://www.ncbi.nlm.nih.gov/pmc/
Environmental Protection Agency (EPA)	PMC[d]	https://www.ncbi.nlm.nih.gov/pmc/
Food and Drug Administration	PMC	https://www.ncbi.nlm.nih.gov/pmc/
National Aeronautics and Space Administration	PMC (via PubSpace)	https://www.nasa.gov/open/researchaccess/
National Institute of Standards and Technology	PMC	https://www.ncbi.nlm.nih.gov/pmc/funder/nist/
National Institutes of Health	PMC	https://www.ncbi.nlm.nih.gov/pmc/
National Oceanic and Atmospheric Administration	NOAA Institutional Repository	https://repository.library.noaa.gov/
National Science Foundation (NSF)	NSF Public Access Repository (NSF-PAR)	https://par.nsf.gov
U.S. Agency for International Development	Development Experience Clearinghouse	https://dec.usaid.gov
U.S. Geological Survey	Publications Warehouse	https://pubs.er.usgs.gov/

Source: GAO analysis of agency questionnaires and documents. | GAO-20-81

[a]CDC also maintains a publications repository called CDC Stacks, which provides access to multiple types of documents to meet a broader information need rather than just peer-reviewed publications. CDC Stacks provides access to select CDC publications, guidelines, posters, as well as other public health documents. According to CDC officials, all CDC publications are dually hosted in PMC and CDC Stacks.

[b]The U.S. Forest Service also maintains a repository called TreeSearch to store and make publicly available Forest Service publications.

[c]DOT officials cited a number of repositories the agency uses to make publications publicly available in addition to ROSA-P. Many of these repositories are maintained by DOT subcomponent agencies, and agency officials said that a number of these repositories operate under policies or legislation that require publications to be made publicly available at these specific locations.

[d]In addition to PMC, EPA officials cited EPA's Science Inventory as a publicly searchable database of research products primarily from its Office of Research and Development. Science Inventory provides abstracts and references to EPA-funded research residing in non-EPA repositories.

Appendix III: Comments from the Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
The Secretary of Commerce
Washington, D.C. 20230

November 12, 2019

Mr. John Neumann
Managing Director, Science, Technology Assessment,
and Analytics
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO) draft report titled *Federal Research: Additional Actions Needed to Improve Public Access to Research Results* (GAO-20-81, November 2019).

On behalf of the Department of Commerce, I have enclosed our comments on the draft report. We believe that the draft report accurately captures much of the progress and many of the challenges faced by the Department and other agencies in working toward the goals of providing public access to the results of federally funded research.

We agree with the three recommendations for the Department, and the National Institute of Standards and Technology and the National Oceanic and Atmospheric Administration are taking actions to implement them, many of which will be completed by December 2020. We will provide additional details when we submit our Action Plan.

If you have any questions, please contact MaryAnn Mausser at (202) 482-8120.

Sincerely,

Wilbur Ross

Enclosure

Department of Commerce
Comments on the GAO Draft Report Titled
Federal Research: Additional Actions Needed to Improve Public Access to Research Results
(GAO-20-81, November 2019)

The Department of Commerce has reviewed the draft report, and we offer the following comments for the Government Accountability Office's (GAO) consideration.

General Comments

The Draft Report accurately captures much of the progress and many of the challenges faced by the Department and other agencies in working toward the goals of providing public access to the results of federally funded research.

Comments on Recommendations

GAO made three recommendations to the Department in the report – one to Commerce's National Institute of Standards and Technology (NIST) and two to the National Oceanic and Atmospheric Administration (NOAA).

Recommendation 28

The National Oceanic and Atmospheric Administration Administrator should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Commerce Response: We agree with this recommendation, and NOAA has been working toward this goal.

NOAA is pursuing multiple mechanisms to achieve researchers' publication and data access requirements.

1. NOAA's implementation of required data management plans from both internal and external researchers has had a positive effect, especially on the availability of research data.

2. NOAA's Central Library has continued to make publications describing research discoverable and accessible. It is actively exploring additional mechanisms and tools (e.g. Clearinghouse for the Open Research of the United States, a publisher consortium, as mentioned in the draft report) that will help achieve compliance for publication requirements.

NOAA will continue to pursue this multi-pronged approach to ensure researcher compliance.

Recommendation 33

The National Institute of Standards and Technology Director should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Commerce Response: The Department of Commerce agrees with this recommendation.

NIST will take the following actions to ensure researcher compliance with public access requirements:

1. NIST will develop an editorial review system to identify NIST-authored papers that have been published. Metadata for these papers will be compared to metadata for NIST-authored papers available through the NIST publications repository to ensure that all NIST authors are in compliance with the requirement that papers are made freely available within 12 months of publication. Completion of this system is expected by December 31, 2020.

2. NIST will evaluate the practicality of combining information in awardees' Research Performance Progress Reports with information provided by the Clearinghouse for the Open Research of the United States in order to associate publications with grants. Completion of this evaluation is expected by December 31, 2020.

3. NIST will review Data Management Plans (DMPs) to evaluate the quality and awardees' compliance with the DMPs, as well as Federal Program Officers' compliance with the NIST requirement to create a record for each awardee's data in the NIST data inventory system. The initial review of collected information will be completed by December 31, 2019.

Recommendation 38

As the Subcommittee on Open Science moves forward, the National Oceanic and Atmospheric Administration co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

Commerce Response: NOAA agrees with this recommendation.

NOAA has realized the benefits from such coordination, such as the development of NOAA's publication repository through coordination with the Centers for Disease Control and Prevention. In addition to support for community best practices for collaboration, NOAA also recognizes new opportunities for Federal coordination among agencies with the recent passage of both the Foundations for Evidence-Based Policymaking Act and the Geospatial Data Act, which both mandate multi-agency mechanisms for collaboration and coordination for Federal data. NOAA has been actively participating in the communication and implementation of these new Acts, as well as the Executive Office of the President's Executive Order on Artificial Intelligence and the Federal Data Strategy. The NOAA Subcommittee co-chair will leverage NOAA's participation in these other community activities to identify more opportunities for collaboration with the Subcommittee on Open Science to promote access to research results.

Appendix IV: Comments from the Department of Defense

DEFENSE TECHNICAL INFORMATION CENTER
8725 JOHN J. KINGMAN ROAD
FORT BELVOIR, VIRGINIA 22060-6218

IN REPLY REFER TO:

Mr. John Neumann,
Director, Natural Resources & Environment
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

NOV 08 2019

Dear Mr. Neumann,

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-20-81, "FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results" dated September 27, 2019 (GAO Code 102451)

Attached is DoD's proposed response to the subject report. My point of contact is Ms. Yvette Jacks who can be reached at yvette.r.jacks.civ@mail.mil and 571-448-9901.

Sincerely,

CHRISTOPHER THOMAS
Administrator

GAO DRAFT REPORT DATED NOVEMBER 1, 2019
GAO-20-81 (GAO CODE 102451)

"FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS."

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

DoD RESPONSE: Partially Concur. Paragraph 2, page 40 of the GAO Report -20-81, "Balancing sensitive information with public access," discusses the challenges faced by Federal agencies in safeguarding national security and personally identifiable information under the public access paradigm. Release review of data requires specific subject matter expertise, understanding of operational security issues and potential misuse of data, and the impact of the mosaic effect of aggregation potentially revealing national security vulnerabilities. The Department is researching methodologies to address aggregation of multiple sets of unclassified data where analysis across data sets can reveal national security vulnerabilities. Once an acceptable methodology is developed, the DoD will issued guidance.

RECOMMENDATION 8: The GAO recommends that the Secretary of Defense complete development of data management plan requirements for extramural researchers.

DoD RESPONSE: Concur. Requirements for Data Management Plan (DMP) submission for award recipients is in draft for the next version of the DoD Grant and Agreement Regulations (DoDGARs). A similar requirement will be proposed for the Defense Federal Acquisition Regulation Supplement (DFARS). The Army has established a DMP requirement for extramural science and technology programs through Assistant Secretary of the Army for Acquisition Logistics and Technology Memorandum, "Coordinating and Disseminating Technical Documentation Resulting from Army Intramural and Extramural Research," dated October 31, 2018. In addition, some DoD components include a requirement for DMPs in their Broad Agency Announcements (BAA).

RECOMMENDATION 19: The GAO recommends that the Secretary of Defense evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

DoD RESPONSE: Concur. The DoD is developing an automated DMP builder/tool as a template for researchers to use at the beginning of a project. Once the tool is fielded, a training program for researchers and program managers will be developed including an outline of the preferred structure for the DMP, a description of the essential elements of the plan and a methodology to evaluate its content. It is important that national security considerations be appropriately factored into the evaluation process not only within the confines of the program

itself, but also in how the data relate to other programs in the DoD research portfolio to preclude unanticipated aggregation vulnerabilities. This will occur after, as discussed in the Response to Recommendation 1, the DoD has developed methodologies to address aggregation of multiple sets of unclassified data where analysis across data sets can reveal national security vulnerabilities.

RECOMMENDATION 23: The GAO recommends that the Secretary of Defense develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

DoD RESPONSE: Concur. DoD is currently investigating methods to conduct gap analysis evaluations to identify instances of non-compliance. The size and complexity of the Department presents unique challenges for inventorying all research programs.

RECOMMENDATION 35: The GAO recommends that as the Subcommittee on Open Science moves forward, the Department of Defense co-chair, in coordination with other co-chairs and participating agencies, takes steps to fully implement leading practices that enhance and sustain collaboration.

DoD RESPONSE: Concur. The DoD co-chair participates in Subcommittee initiatives, including the working group on disclosure risk management, a topic of great importance to the DoD.

Appendix V: Comments from the Department of Education

UNITED STATES DEPARTMENT OF EDUCATION
Institute of Education Sciences

October 24, 2019

Mr. John Neumann
Managing Director
Science, Technology Assessment, and Analytics
Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Neumann:

I am pleased to provide the U.S. Department of Education's (Department's) response to the Government Accountability Office's (GAO's) draft report titled *Federal Research: Additional Actions Needed to Improve Public Access to Research Results* (GAO-20-81).

As noted in the draft GAO report, the Department's Institute of Education Sciences (IES) and our colleagues in the Department have been working for several years to expand public access to publications and data from our research investments. We have significantly expanded the number of full-text scholarly publications from federally funded research available to the public at no cost through our Education Resources Information Center (ERIC), in accordance with the Office of Science and Technology Policy memorandum.[1]

On page 44 of the draft report, GAO recommended:

> The Secretary of Education should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

We concur with the recommendation. As noted in this report, IES has awarded a contract to support enhancements to ERIC to link scholarly research publications supported by the Department to its publicly accessible datasets. We expect to complete this work no later than the end of fiscal year 2020 (September 30, 2020).

[1] Office of Science and Technology Policy, *Increasing Access to the Results of Federally Funded Scientific Research* Memorandum, (Washington, D.C.: February 22, 2013).

550 12 St. SW, WASHINGTON, D.C. 20202

Thank you for the opportunity to respond to this recommendation and provide the enclosed technical comments. If you or your staff have any questions regarding our response, please contact Dr. Elizabeth Albro, Commissioner of the National Center for Education Research, at Elizabeth.Albro@ed.gov.

Sincerely,

Mark Schneider
Director

Enclosure

Appendix VI: Comments from the Department of Energy

Department of Energy
Washington, DC 20585

November 8, 2019

Mr. John Neumann
Managing Director
Science, Technology Assessment, and Analytics
U.S. Government Accountability Office
441 G Street N.W.
Washington, DC 20548

Dear Mr. Neumann:

The Department of Energy (DOE or "Department") appreciates the opportunity to comment on the Government Accountability Office's (GAO) draft report titled, *Federal Research: Additional Actions Needed to Improve Public Access to Research Results* (GAO-20-81).

The report contains 39 recommendations, of which GAO directed three recommendations to DOE. DOE concurs with each of GAO's recommendations. The Department's plan to address GAO's recommendations follows.

Recommendation 20: The Secretary of Energy should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans (DMPs) and, if additional training is found to be warranted, develop and provide such training.

DOE Response: Concur

The Department will assess and develop a plan to meet the training needs of internal DOE staff and external peer reviewers of DMPs.

Estimated Completion Date: December 31, 2020

Recommendation 29: The Secretary of Energy should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

DOE Response: Concur

GAO's recommendation for public access to scientific publications for its extramural researchers (financial assistance recipients) complements DOE's already developed and fully implemented public access plan compliance mechanism for the scholarly publications emanating from its 17 national laboratories (as noted on page 31 of draft report). DOE will develop a compliance mechanism to identify researchers receiving DOE funding from financial assistance awards (extramural researchers for purposes of the report) who are not compliant with DOE's Public Access Plan for publications.

Using existing DOE and programmatic business processes for managing financial assistance awards, DOE will establish compliance mechanisms which will include providing the DOE program or awarding offices routine information regarding gaps in identified scholarly publications and accepted manuscripts, in accordance with the DOE Plan for their areas of responsibility. Also, as part of the existing award process, DOE's Office of Scientific and Technical Information (OSTI) will work with individual DOE program or awarding office officials on a consistent basis to address identified gaps and develop plans to acquire missing manuscripts accepted for public use. Focus areas to be addressed include: review/development of programmatic specific mechanisms, communication of requirements and training, recipient notifications as warranted, and award closeout guidelines.

Estimated Completion Date: December 31, 2020

Recommendation 36: As the Subcommittee on Open Science moves forward, the Department of Energy co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

DOE Response: Concur

The Department of Energy, as a co-chair of the Subcommittee on Open Science, is actively identifying areas of collaboration across agencies in implementing open science practices. Through both the Subcommittee and existing partnering agreements, agencies are sharing best practices and developing streamlined models for implementing public access to federal research results.

Estimated Completion Date: Ongoing

GAO should direct any questions to Judy Gilmore, Acting Director, Office of Scientific and Technical Information, at 865-576-5600, or via e-mail to gilmorej@osti.gov.

Sincerely,

Chris Fall
Director, Office of Science

Appendix VII: Comments from the Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 25 2019

OFFICE OF
RESEARCH AND DEVELOPMENT

Mr. John Neumann
Director, Science, Technology Assessment, and Analytics
U.S. General Accountability Office
Washington, D.C. 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on GAO's draft report entitled *Federal Research: Additional Actions Needed to Improve Public Access to Research Results* (GAO-20-81).

We are pleased to report on September 26, 2019, EPA released EPA Order 1000.17B, *Policy for Increasing Access to Results of EPA-Funded Extramural Scientific Research*[1] (EPA Order). EPA Order was developed to implement the requirements outlined in the February 22, 2013 White House Office of Science and Technology Policy (OSTP) memorandum[2] for extramural agreements. The EPA Order describes requirements for EPA offices that manage research through extramural assistance agreements. This was the third and final implementation phase of EPA's *Plan to Increase Access to Results of EPA-Funded Scientific Research*[3]. With the release of the EPA Order, information in the GAO-20-81 is no longer up-to-date, both in the report and recommendations. Specifically, EPA's information in Tables 2 and 3 of GAO-20-81 is no longer accurate and should be updated to reflect the EPA Order issuance and EPA's full implementation of EPA's *Plan to Increase Access to Results of EPA-Funded Scientific Research.*

EPA responses to GAO-20-81 recommendations are provided below:

Recommendation 11: The Environmental Protection Agency Administrator should complete development of data management plan requirements for extramural researchers.

Response: EPA agrees with this recommendation. With the issuance of the EPA Order, this recommendation has been completed. The EPA extramural policy requires data management plans (DMPs) be included by extramural researchers in applications/proposals submitted to EPA for funding.

[1] https://www.epa.gov/sites/production/files/2019-09/documents/order_1000_17b.pdf
[2] https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf
[3] https://www.epa.gov/sites/production/files/2016-12/documents/epascientificresearchtransperancyplan.pdf

Recommendation 21: The Environmental Protection Agency Administrator should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

Response: EPA agrees with this recommendation. The agency will evaluate the training needs for agency officials who review intramural and extramural researchers' DMPs during FY 2020.

Recommendation 32: The Environmental Protection Agency Administrator should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Response: EPA agrees with the recommendation. With the issuance of the EPA Order, this recommendation has been completed. As indicated in GAO-20-81, EPA has developed and implemented a compliance process for intramural research. The EPA Order puts into place compliance measures for the third and final implementation phase of EPA's public access plan.

Thank you again for the opportunity to review and respond to the GAO's draft report, *Federal Research: Additional Actions Needed to Improve Public Access to Research Results*. If additional information is needed, please contact the Office of Resource Management's Maureen Hingeley at 202-564-1306 or the Office of Science Advisor, Policy and Engagement's Tom Sinks at 202-564-3099.

Sincerely,

Jennifer Orme-Zavaleta, Ph.D.
Principle Deputy Assistant Administrator and
EPA Science Advisor

Appendix VIII: Comments from the Department of Health and Human Services

DEPARTMENT OF HEALTH & HUMAN SERVICES

OFFICE OF THE SECRETARY

Assistant Secretary for Legislation
Washington, DC 20201

OCT 24 2019

John Neumann
Managing Director, Science, Technology Assessment
& Analytics
U.S. Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Neumann:

Attached are comments on the U.S. Government Accountability Office's (GAO) report entitled, "*Federal Research: Additional Actions Needed to Improve Public Access to Research Results*" (GAO-20-81).

The Department appreciates the opportunity to review this report prior to publication.

Sincerely,

Sarah Arbes
Acting Assistant Secretary for Legislation

Attachment

GENERAL COMMENTS FROM THE DEPARTMENT OF HEALTH & HUMAN SERVICES ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S DRAFT REPORT ENTITLED – FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS (GAO-20-81)

Recommendation 3
The Director of AHRQ should take steps to ensure appropriate agency funded research data are readily findable and accessible to the public.

AHRQ Response:
AHRQ concurs with GAO recommendation.

AHRQ has developed a draft Data Management Plan policy as the first step toward making the AHRQ funded research data available for public access. This policy will be published by January 2020. By December 2020 AHRQ will publish its policy for public access to data developed under AHRQ-funded research.

Recommendation 4
The Commissioner of FDA should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

FDA Response:
FDA concurs with GAO Recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will ensure that publicly disclosable, agency-funded research data are readily findable and accessible to the public through expansion of the FDA Library's new FindIT platform.

Recommendation 9
The Director of AHRQ should complete the development of data management plan requirements.

AHRQ Response:
AHRQ concurs with GAO recommendation.

The data management plan policy will be published by January 2020.

Recommendation 15
The Commissioner of FDA should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

FDA Response:
FDA concurs with GAO Recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will collaborate with other HHS operating divisions to evaluate and, if warranted, improve FDA's data management plan (DMP) instructions and guidance as well as training of FDA personal involved in reviewing researchers' DMPs.

GENERAL COMMENTS FROM THE DEPARTMENT OF HEALTH & HUMAN SERVICES ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S DRAFT REPORT ENTITLED - FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS (GAO-20-81)

Recommendation 18
The Director of AHRQ should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data management plans and if additional training is found to be warranted, develop and provide such training.

AHRQ Response:
AHRQ concurs with GAO Recommendation.

AHRQ will assess training needs for agency officials and others involved in reviewing the merits of researchers' data management plans and provide required training as warranted.

Recommendation 24
The Director of AHRQ should develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

AHRQ Response:
AHRQ concurs with GAO recommendation.

AHRQ will develop and implement a mechanism to ensure researcher compliance with public access plan and associated requirements. AHRQ will continue to use the NIH/PUBMED publication repository as the compliance mechanisms for the publications public access requirement and will use progress reports and final reports, such as Research Performance Progress Reports (RPPR), as part of the compliance process.

Recommendation 25
The Commissioner of FDA should develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

FDA Response:
FDA concurs GAO recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will enlarge the scope of its Library FindIT system to include analytics and reporting capabilities directed to researchers' compliance with their public access plan and associated requirements.

GENERAL COMMENTS FROM THE DEPARTMENT OF HEALTH & HUMAN SERVICES ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S DRAFT REPORT ENTITLED - FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS (GAO-20-81)

Recommendation 26
The Director of the National Institutes of Health should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

NIH Response:
NIH concurs with GAO's recommendation.

As previously provided in its responses to GAO, NIH has fully developed and implemented mechanisms to ensure researcher compliance with the publications portion of its public access plan (NIH's Public Access Policy). Regarding data, NIH has several data sharing policies and initiatives across NIH for which compliance mechanisms are in place. NIH is currently focusing its efforts on drafting an agency-wide data management and sharing policy and associated guidance that will fully implement its public access plan, including mechanisms to ensure researcher compliance. NIH anticipates releasing the draft policy and draft guidance before the end of 2019 for public comment, to inform the development of a final NIH data management and sharing policy. Therefore, NIH suggests that the recommendation be revised to reflect that NIH has a long-standing, fully developed compliance program for the NIH Public Access Policy for publications and is in the process of developing a policy that will fully implement its public access plan for data. NIH will provide an update in our 180-day letter response.

Recommendation 37
As the Subcommittee on Open Science moves forward, the National Institutes of Health co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

NIH Response:
NIH concurs with GAO's recommendation.

As noted in the GAO draft report, with leadership from NIH, the Subcommittee on Open Science and its working groups are actively coordinating and building consensus on issues and processes to implement leading practices that enhance and sustain collaboration across federal agencies. NIH is both sharing leading practices learned from its experience with public access and learning from the successful practices of other agencies. NIH will provide an update in our 180-day letter response.

TECHNICAL COMMENTS FROM THE DEPARTMENT OF HEALTH & HUMAN SERVICES ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S DRAFT REPORT ENTITLED – FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS (GAO-20-81)

The National Institutes of Health (NIH) appreciates the review conducted by Government Accountability Office (GAO) and the opportunity to provide technical comment on this draft report.

Page 14, Second Full Paragraph
It states that, "…NIH reported it is developing a web-based mechanism that would allow data in multiple NIH data repositories to be found and used from a central point of access." This language did not appear in the Statement of Facts, and NIH requests that the language be changed to, "NIH reported that it is developing a mechanism, using industry standard web-based technologies, to provide a federated experience for biomedical researchers to access NIH-funded data resources in the cloud."

Appendix IX: Comments from the Department of Homeland Security

U.S. Department of Homeland Security
Washington, DC 20528

Homeland Security

October 24, 2019

John Neumann
Managing Director, Science, Technology Assessment, and Analytics
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Re: Management Response to Draft Report GAO-20-81, "FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results"

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The Department agrees with the importance and benefits of providing public access to federally funded research results. In this regard, DHS established a publication repository through the National Institutes of Health PubMed Central (PMC) for the preservation and public access to scientific publications resulting from DHS funding, which currently includes 1,131 articles. The Department remains committed to implementing plans supporting increased public access to federally funded research, which will be managed by a DHS Public Access Advisory Group.

The draft report contained 39 recommendations, including four for DHS with which the Department concurs. Attached find our detailed response to each recommendation. DHS previously submitted technical comments under a separate cover.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact me if you have any questions. We look forward to working with you again in the future.

Sincerely,

JIM H. CRUMPACKER, CIA, CFE
Director
Departmental GAO-OIG Liaison Office

Attachment

Attachment: Management Response to Recommendations Contained in GAO-20-81

GAO recommended that the Secretary of Homeland Security:

Recommendation 5: Take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

Response: Concur. The Department is fully committed to the principals of open access to government funded research and development. The Science & Technolgy (S&T) Office of Strategy and Policy (OSP)/Knowledge Management Branch (KM) is in the process of establishing a portal on the DHS website to increase public access to agency-funded research, as appropriate. Estimated Completion Date (ECD): June 30, 2020.

Recommendation 10: Complete development of data management plan requirements.

Response: Concur. S&T OST/KM will develop a DHS-wide Management Directive and Instruction for research and development data, as well as DHS Research and Development Data Management Plan (DMP) guidance and a template to document requirements. ECD: June 30 2020.

Recommendation 16: Evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

Response: Concur. S&T OST/KM, working with the DHS Public Access Advisory Group, will evaluate training needs for the review of DMPs after completion of the DHS-wide Management Directive and Instruction, and the DMP documents discussed above. S&T will also develop plans to fulfill any additional training needs identified by this evaluation. ECD: September 30, 2020.

Recommendation 27: Develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Response: Concur. S&T OST/KM, working with the DHS Public Access Advisory Group, will develop a mechanism to ensure researcher compliance with the DHS Public Access Plan and DMP requirements. ECD: September 30, 2020.

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Appendix X: Comments from the Department of Transportation

U.S. Department of Transportation
Office of the Secretary of Transportation

Assistant Secretary for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

OCT 2 8 2019

John Neumann
Managing Director, Science, Technology Assessment, and Analytics
U.S. Government Accountability Office (GAO)
441 G Street NW
Washington, DC 20548

Dear Mr. Neumann:

The Department of Transportation (DOT or the Department) is committed to ensuring public access to the results of DOT-funded scientific research reports and digital datasets. The Department's Public Access plan (December 2015) is designed to drive innovation in transportation through the sharing of research publications and associated digital datasets with the public. This sharing, within DOT and with the public, enables synergies and innovations no single DOT Operating Administration can achieve on its own.

The Department has made improvements to its Public Access Policy plan implementation by establishing a Public Access Implementation Working Group. This working group, consisting of representation from each DOT Operating Administration, is currently developing a compliance mechanism for the Public Access plan.

Upon review of the draft report, we concur with recommendation 31 to fully develop and implement a mechanism to ensure researcher compliance with DOT's public access plan and associated requirements. We will provide a detailed response to the recommendation within 180 days of the final report's issuance.

We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline M. Chulumovich, Director, Audit Relations and Program Improvement, at (202) 366-6512 with any questions.

Sincerely,

Keith Washington
Deputy Assistant Secretary for Administration

Appendix XI: Comments from the National Science Foundation

National Science Foundation
Office of the Director

October 15, 2019

John Neumann
Managing Director
Science, Technology Assessment, and Analytics
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and provide comments on the Government Accountability Office (GAO) draft report, *FEDERAL RESEARCH: Additional Action Needed to Improve Public Access to Research Results (GAO-20-81).* The National Science Foundation (NSF) values the GAO staff's professionalism and many constructive interactions during this GAO engagement.

NSF appreciates GAO's acknowledgement of agency efforts to fully implement the 2013 Office of Science and Technology Policy (OSTP) memorandum, Increasing Access to the Results of Federally Funded Research. The Foundation has invested substantially in related research and community outreach since the NSF plan (NSF 15-052) was released in 2015 and continually monitors performance of the Public Access Repository (PAR). In collaboration with Department of Energy, NSF has implemented two upgrades to PAR to streamline deposit of papers, as your study acknowledges, and to support public access to workshop final reports. The Foundation is currently exploring mechanisms through PAR to enhance discoverability of data.

NSF concurs with the two recommendations made by GAO to ensure that appropriate agency-funded research data are findable and accessible and to work with other agencies on implementation of leading practices.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact Veronica Shelley at vshelley@nsf.gov or 703-292-4384 if you have any questions or require additional information. We look forward to working with you again in the future.

Sincerely,

France A. Córdova
Director

2415 Eisenhower Avenue, Suite 19100 Alexandria, VA 22314

Appendix XII: Comments from the United States Agency for International Development

October 28, 2019

John Neumann
Managing Director, Science, Technology-Assessment, and Analytics
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20226

Dear Mr. Neumann:

I am pleased to provide the formal response of the U.S. Agency for International Development (USAID) to the draft report produced by the U.S. Government Accountability Office (GAO) titled, *Federal Research: Additional Actions Needed to Improve Public Access to Research Results* (GAO 20-81).

The draft report contains two recommendations for USAID. The Agency concurs with both of the GAO's recommendations regarding the development of data-management plans and trainings for researchers. We are pleased to inform you that we are actively addressing them.

USAID is committed to open data and evidence-informed investments by constantly improving the quality and integrity of our data and adhering to the principles outlined in USAID's Public-Access Plan. USAID fully supports the requirement that Agency-funded programmatic partners who collect or acquire data must create, and adhere to, a data-management plan. We are equally committed to training our staff to assess and oversee the implementation of these plans.

USAID is currently updating the Agency's policy on data, found in Chapter 579 of the Automated Directives System (ADS), USAID Development Data, to ensure our staff require data-management plans from our extramural researchers. In addition, we have delivered training on the essentials of data-management plans during the Agency's Worldwide Program Officer Conference just this month. This training augments other data-management training sessions we have provided to our staff in the Kingdom of Cambodia, the Federal Democratic Republic of Nepal, and the Republic of The Philippines over the past twelve months.

Ultimately, USAID envisions setting up a unified portal through which our partners manage their submission of digital evidence to the Agency, including research manuscripts, underlying research data, and supporting documentation. We are making this vision a reality through the Development Information Solution (DIS), an investment approved by the Office of Management and Budget (OMB) that is currently in use on a pilot basis at several of our Missions around the world.

As an example of our commitment to increasing public access to Agency-funded research, I am also pleased to report that, as of last month, USAID uploaded more than 16,000 metadata records to the Development Experience Clearinghouse repository, which makes the research they represent more easily discoverable and searchable. In addition, in the next few months we plan to join World RePORT, an open-access, interactive mapping database hosted by

the National Institutes of Health within the U.S. Department of Health and Human Services that highlights biomedical research investments and partnerships from some of the world's largest funding organizations.

I am transmitting this letter and the enclosed comments from USAID for inclusion in the GAO's final report. Thank you for the opportunity to respond to the draft report, and for the courtesies extended by your staff while conducting this engagement. We appreciate the opportunity to participate in the complete and thorough evaluation of our implementation of our Public-Access Plan for the research we fund.

Sincerely,

Albert Bullock
Deputy Assistant Administrator
Bureau for Management

Enclosure: a/s

2

COMMENTS BY THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT ON THE DRAFT REPORT PRODUCED BY THE U.S. GOVERNMENT ACCOUNTABILITY OFFICE (GAO) TITLED, *Federal Research: Additional Actions Needed to Improve Public Access to Research Results*, (GAO 20-81)

The U.S. Agency for International Development (USAID) would like to thank the U.S. Government Accountability Office (GAO) for the opportunity to respond to this draft report. We appreciate the extensive work of the GAO engagement team. The specific findings will help USAID ensure that the public has easy access to the results of the research we fund and that researchers comply with the Agency's public-access requirements.

The draft report contains two recommendations for USAID. The Agency agrees with both recommendations, and is already addressing them.

1. **The U.S. Agency for International Development Administrator should complete development of data-management plan (DMP) requirements for extramural researchers. (Recommendation 12)**

USAID is committed to ensuring that Agency-funded data are publicly available, and is taking specific measures to fulfill this promise. As an example of our commitment to increasing public access to Agency-funded research, as of September 2019 USAID has uploaded more than 16,000 metadata records to the Development Experience Clearinghouse repository, which makes the research they represent more easily discoverable and searchable. In addition, in the next few months we plan to join World RePORT, an open-access, interactive mapping database hosted by the National Institutes of Health within the U.S. Department of Health and Human Services that highlights biomedical research investments and partnerships from some of the world's largest funding organizations.

USAID is developing standardized guidance to implement the DMP requirements for all future research programs globally. For research activities and others funded by USAID that collect, acquire, or otherwise generate data, the Agency will require that partners submit DMPs and receive approval before they gather data. The Agency is making substantial revisions to its data policy, found in Chapter 579 of the Automated Directives System (ADS), USAID Development Data. These amendments will direct USAID's staff to include the submission of a DMP as an essential element of all new programs, which will bolster public access to Agency-funded research results, and incorporate additional measures to ensure compliance with the Foundations for Evidence-Based Policymaking Act. In the interim, as noted in the GAO report, some USAID Operating Units have started implementing their own DMP requirements.

In the near future, USAID envisions a unified portal through which our partners can manage their submission of digital evidence to the Agency, to include research manuscripts, underlying research data, and supporting documentation. We are making this vision a reality through the Development Information Solution (DIS), an investment approved by the Office of Management and Budget (OMB) that is currently in use on a pilot basis at several of our Missions around the world.

USAID's Office of the Chief Information Officer (CIO) in the Bureau for Management (M) will be responsible for ensuring the implementation of this recommendation, and will initiate the steps above within 12 months of issuance of the GAO's final report.

2. **The U.S. Agency for International Development Administrator should complete development of and provide training for agency officials or others involved in reviewing the merits of researchers' DMPs. (Recommendation 14)**

USAID recognizes the importance of training the staff who oversee the DMP process. USAID Data Services within the Office of the CIO in the M Bureau is currently refining an expansive Data-Literacy Training Program that involves the development of both in-person classwork and a series of highly interactive e-Learning modules with various multimedia resources. The curriculum includes a Certification Program that will create a path for career advancement and professional growth in data science within USAID.

USAID Data Services will provide training and guidance on the development and evaluation of DMPs for the Agency's officials and stakeholders. To reach a broad audience efficiently, Data Services will develop an e-Learning series that addresses the creation, submission, evaluation, and approval of DMPs. The e-Learning series curriculum will build on existing material on data-management planning previously developed with, and delivered to, USAID's Global Health staff. It will also leverage other training materials in data-management planning presented to USAID staff at several Agency Missions and at the 2019 Worldwide Program Officer Conference.

USAID's Office of the CIO in the M Bureau will be responsible for ensuring the implementation of this recommendation, and will initiate the steps above within 12 months of the issuance of the GAO's final report.

Additional Technical Comment: On page 18 of the draft report, in Table 2, titled, "Agency-Reported Data-Management Plan (DMP) Requirements as of August 2019," the row for USAID contains a footnote in the column headed, "DMP requirement for intramural researchers." The footnote says, "Agency funds either intramural or extramural research." Please note that USAID does not fund intramural research; the Agency only funds extramural research. Further, we recommend that the GAO move footnote "f" to column 3 with the header, "DMP requirement for extramural researchers."

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CLEARANCE PAGE for USAID Comments on GAO Draft Report titled, Public Access to Federally Funded Research Results, (GAO 20-81)

Clearances:

Jay Mahanand	/S/	10/7/2019

Bureau/IO	**Clearance Status**	**Date**
GAO-L: GYang	Clear	10/11/19
Dep CFO (Overseas):KBody	INFO	10/11/19
GC (Acting): MCohen	Clear	10/7/19
SDAA/LPA Eddy Acevedo	Clear	10/11/19
PPL/Audit: GYang	Clear	10/11/19
DAA/M: AEL-ABD	Clear	10/11/19
AA/M: FNutt	Clear	10/11/19
ES: MYoung	Clear	10/18/19
ES: EBakely	Clear	10/18/19
ES: ECarr	Clear	10/21/19
ES: AHarvey	Clear	10/21/19
FO: BPichanick	INFO	10/21/19

cc:
Audit Analysts

Drafter: M:Brandon Pustejovsky:703-666-5643; October 1, 2019

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Appendix XIII: Comments from the United States Department of Agriculture

United States Department of Agriculture
Research Education Economics
Office of the Under Secretary
Room 216W Jamie L. Whitten Building Washington, D.C. 20250-0110

November 4, 2019
Mr. John Neumann
Managing Director, Science, Technology Assessment, and Analytics
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Mr. Neumann:

The U.S. Department of Agriculture (USDA) appreciates the opportunity to respond to the U.S. Government Accountability Office (GAO) draft report "FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results, GAO Report Number GAO-20-81" dated November 2019.

USDA agrees with the findings in the GAO draft report. All stylistic and substantive issues with the report have been resolved in earlier reviews with the GAO leads.

Thank you again for the opportunity to review and respond to the GAO draft report.

Sincerely,

Scott H. Hutchins, Ph.D.
Deputy Under Secretary
Research, Education, and Economics

Appendix XIV: Comments from the Department of Veterans Affairs

DEPARTMENT OF VETERANS AFFAIRS
WASHINGTON DC 20420

NOV 01 2019

Mr. John Neumann
Managing Director
Science, Technology Assessment,
and Analytics
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Neumann:

The Department of Veterans Affairs (VA) has reviewed the Government Accountability Office (GAO) draft report: ***FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results*** (GAO-20-81).

The enclosure contains general comments and sets forth the actions to be taken to address the draft report recommendations.

VA appreciates the opportunity to comment on your draft report.

Sincerely,

Pamela Powers
Chief of Staff

Enclosure

Enclosure

Department of Veterans Affairs (VA) Comments to
Government Accountability Office (GAO) Draft Report
FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results
(GAO-20-81)

General Comments:

The Department of Veterans Affairs (VA), through the Veterans Health Administration's (VHA) Office of Research and Development (ORD), has been committed to the principles and practice of public access to research results, now more commonly referred to as Open Science. In addition to early adoption of requirements for the registration and subsequent inclusion of results from ORD funded clinical trials (see https://doi.org/10.1016/j.cct.2017.04.002), VA currently has over 16,000 publications included in the PubMed Central database.

VA has also taken steps toward establishing a framework and capacity for making data sets available to investigators. The ORD Cooperative Studies Program has established a clearinghouse as a way to help qualified researchers access epidemiologic research data. As an effort that began in 2018, a curated list of VA and non-VA funded studies involving Veterans can be searched for additional information to generate new opportunities for research. This activity is called the Integrated Veteran Epidemiologic Study Data Resource and can be found at https://www.vacsp.research.va.gov/CSPEC/Studies/INVESTD-R/Main.asp. It contains information on nearly 70 study databases and continues to add to this collection.

VA will continue to work with its partners, including the Office of Information and Technology, Office of Enterprise Integration, and other groups to determine opportunities to obtain and leverage resources to grow existing efforts and/or create new capabilities to facilitate public access to research results.

1

Enclosure

Department of Veterans Affairs (VA) Comments to
Government Accountability Office (GAO) Draft Report
FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results
(GAO-20-81)

Recommendation 1: The Secretary of Veterans Affairs should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

VA Comment: Concur. Through the Veterans Health Administration's (VHA) Office of Research and Development (ORD), the Department of Veterans Affairs (VA) has been an active participant in Federal efforts related to Open Science and to make agency-funded research data readily findable and accessible to the public. As noted in the report, VA efforts have focused on having its publications included in the National Institutes of Health-supported PubMed Central repository (see https://www.ncbi.nlm.nih.gov/pmc/funder/va/) with over 16,000 publications currently included. Additionally, summary data from all VHA ORD funded clinical trials are submitted to Clinicaltrials.gov.

VA continues to work with its Federal partners as part of larger efforts, such as Open Data, towards enhancing how research data are readily findable and accessible to the public. Additionally, further opportunities to achieve the goals of Open Science will be identified through the intra-agency Data Governance Council – co-chaired by the Offices of Information and Technology and Enterprise Integration. VA has completed actions on this recommendation and requests the Government Accountability Office (GAO) consider closure.

Recommendation 2: The Secretary of Veterans Affairs should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

VA Comment: Concur. ORD has implemented requirements for inclusion of Data Management Plans (DMP) as a condition of funding. However, as a relatively new practice for several agencies, there are opportunities to learn how to continually improve this effort. Training is a key part of this process and ORD will seek out needs and opportunities to train program staff and reviewers involved in the scientific review process. In addition to identifying other strong practices among other agencies, VA will meet with program staff to discuss needs and how to better consider the merit of investigator submitted DMPs. Activities envision a phased approach that takes into consideration the fact that ORD scientific review of investigator submissions occur throughout the year and are managed by multiple services within ORD. Additionally, a similar recommendation was made to other agencies, including the Agency for Healthcare Research and Quality and Department of Defense. Therefore, there may be further opportunities to determine how similar practices/tools for compliance can be adopted. Target Completion Date: September 30, 2020.

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Enclosure

Department of Veterans Affairs (VA) Comments to
Government Accountability Office (GAO) Draft Report
FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results
(GAO-20-81)

Recommendation 3: The Secretary of Veterans Affairs should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

VA Comment: Concur. VA continues to be committed to the principles and practice of Open Science for its funded research activities. Given this commitment, ORD has established mechanisms to help with ensuring compliance with its public access plans. These items include requirements for providing DMP and registration of funded clinical trials in Clinicaltrials.gov (see https://doi.org/10.1016/j.cct.2017.04.002). VA has completed actions on this recommendation and requests GAO consider closure.

3

Appendix XV: GAO Contact and Staff Acknowledgments

GAO Contact

John Neumann at (202) 512-6888 or neumannj@gao.gov

Staff Acknowledgments

In addition to the contact named above, Christopher Murray (Assistant Director), Aaron Shiffrin (Analyst in Charge), Lacey Coppage, John Delicath, Diantha Garms, Courtney Krebs, Hayden Huang, Perry Lusk, Dennis Mayo, Anika McMillon, Katrina Pekar-Carpenter, Emily Pinto, Ben Shouse, Amber Sinclair, Jeanette Soares, and Sarah Veale made key contributions to this report. Also contributing to this report were Ben Atwater, Chuck Bausell, Colleen Candrl, Melissa Hargy, Sean Manzano, Will Simerl, and Arvin Wu.

Appendix XVI: Accessible Data

Agency Comment Letters

Accessible Text for Appendix III Comments from the Department of Commerce

Page 1

November 12, 2019

Mr. John Neumann

Managing Director, Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, NW

Washington, DC 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO) draft report titled Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81, November 2019).

On behalf of the Department of Commerce, I have enclosed our comments on the draft report. We believe that the draft report accurately captures much of the progress and many of the challenges faced by the Department and other agencies in working toward the goals of providing public access to the results of federally funded research.

We agree with the three recommendations for the Department, and the National Institute of Standards and Technology and the National Oceanic and Atmospheric Administration are taking actions to implement them,

many of which will be completed by December 2020. We will provide additional details when we submit our Action Plan.

If you have any questions, please contact MaryAnn Mausser at (202) 482-8120.

Wilbur Ross

Enclosure

Page 2

Department of Commerce Comments on the GAO Draft Report Titled

Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81, November 2019)

The Department of Commerce has reviewed the draft report, and we offer the following comments for the Government Accountability Office's (GAO) consideration.

General Comments

The Draft Report accurately captures much of the progress and many of the challenges faced by the Department and other agencies in working toward the goals of providing public access to the results of federally funded research.

Comments on Recommendations

GAO made three recommendations to the Department in the report- one to Commerce's National Institute of Standards and Technology (NIST) and two to the National Oceanic and Atmospheric Administration (NOAA).

Recommendation 28

The National Oceanic and Atmospheric Administration Administrator should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Commerce Response: We agree with this recommendation, and NOAA has been working toward this goal.

NOAA is pursuing multiple mechanisms to achieve researchers' publication and data access requirements.

1. NOAA's implementation of required data management plans from both internal and external researchers has had a positive effect, especially on the availability of research data.

2. NOAA's Central Library has continued to make publications describing research discoverable and accessible. It is actively exploring additional mechanisms and tools (e.g. Clearinghouse for the Open Research of the United States, a publisher consortium, as mentioned in the draft report) that will help achieve compliance for publication requirements.

NOAA will continue to pursue this multi-pronged approach to ensure researcher compliance.

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Recommendation 33

The National Institute of Standards and Technology Director should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Commerce Response: The Department of Commerce agrees with this recommendation.

NIST will take the following actions to ensure researcher compliance with public access requirements:

1. NIST will develop an editorial review system to identify NIST-authored papers that have been published. Metadata for these papers will be compared to metadata for NIST-authored papers available through the NIST publications repository to ensure that all NIST authors are in compliance with the requirement that papers are made freely available within 12 months of publication. Completion of this system is expected by December 31, 2020.

2. NIST will evaluate the practicality of combining information in awardees' Research Performance Progress Reports with information provided by the Clearinghouse for the Open Research

of the United States in order to associate publications with grants. Completion of this evaluation is expected by December 31, 2020.

3. NIST will review Data Management Plans (DMPs) to evaluate the quality and awardees' compliance with the DMPs, as well as Federal Program Officers' compliance with the NIST requirement to create a record for each awardee's data in the NIST data inventory system. The initial review of collected information will be completed by December 31, 2019.

Recommendation 38

As the Subcommittee on Open Science moves forward, the National Oceanic and Atmospheric Administration co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

Commerce Response: NOAA agrees with this recommendation.

NOAA has realized the benefits from such coordination, such as the development of NOAA's publication repository through coordination with the Centers for Disease Control and Prevention. In addition to support for community best practices for collaboration, NOAA also recognizes new opportunities for Federal coordination among agencies with the recent passage of both the Foundations for Evidence-Based Policymaking Act and the Geospatial Data Act, which both mandate multi-agency mechanisms for collaboration and coordination for Federal data. NOAA has been actively participating in the communication and implementation of these new Acts, as well as the Executive Office of the President's Executive Order on Artificial Intelligence and the Federal Data Strategy. The NOAA Subcommittee co-chair will leverage NOAA's participation in these other community activities to identify more opportunities for collaboration with the Subcommittee on Open Science to promote access to research results.

Accessible Text for Appendix IV Comments from the Department of Defense

Page1

Mr. John Neumann,

Director, Natural Resources & Environment

U.S. Government Accountability Office

441 G Street, NW

Washington DC 20548

NOV 08 2019

Dear Mr. Neumann,

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-20-81, “FEDE RAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results” dated September 27, 2019 (GAO Code 102451)

Attached is DoD's proposed response to the subject report. My point of contact is Ms. Yvette Jacks who can be reached at yvette.r.jacks.civ@mail.mil and 571-448-9901.

Sincerely,

CHRISTOPHER THOMAS

Administrator

Page 2

GAO DRAFT REPORT DATED NOVEMBER 1, 2019 GAO-20-81 (GAO CODE 102451)

“FEDERAL RESEARCH: ADDITIONAL ACTIONS NEEDED TO IMPROVE PUBLIC ACCESS TO RESEARCH RESULTS.”

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

DoD RESPONSE: Partially Concur. Paragraph 2, page 40 of the GAO Report -20-81, “Balancing sensitive information with public access,” discusses the challenges faced by Federal agencies in safeguarding national security and personally identifiable information under the public access paradigm. Release review of data requires specific subject matter expertise, understanding of operational security issues and potential misuse of data, and the impact of the mosaic effect of aggregation potentially revealing national security vulnerabilities. The Department is researching methodologies to address aggregation of multiple sets of unclassified data where analysis across data sets can reveal national security vulnerabilities. Once an acceptable methodology is developed, the DoD will issued guidance.

RECOMMENDATION 8: The GAO recommends that the Secretary of Defense complete development of data management plan requirements for extramural researchers.

DoD RESPONSE: Concur. Requirements for Data Management Plan (DMP) submission for award recipients is in draft for the next version of the DoD Grant and Agreement Regulations (DoDGARs). A similar requirement will be proposed for the Defense Federal Acquisition Regulation Supplement (DFARS). The Army has established a DMP requirement for extramural science and technology programs through Assistant Secretary of the Army for Acquisition Logistics and Technology Memorandum, “Coordinating and Disseminating Technical Documentation Resulting from Army Intramural and Extramural Research,” dated October 31, 2018. In addition, some DoD components include a requirement for DMPs in their Broad Agency Announcements (BAA).

RECOMMENDATION 19: The GAO recommends that the Secretary of Defense evaluate training needs for agency officials or others involved in reviewing the merits of researchers’ DMPs and, if additional training is found to be warranted, develop and provide such training.

DoD RESPONSE: Concur. The DoD is developing an automated DMP builder/tool as a template for researchers to use at the beginning of a project. Once the tool is fielded, a training program for researchers and program managers will be developed including an outline of the preferred structure for the DMP, a description of the essential elements of the plan and a methodology to evaluate its content. It is important that national security considerations be appropriately factored into the evaluation process not only within the confines of the program

Page 3

itself, but also in how the data relate to other programs in the DoD research portfolio to preclude unanticipated aggregation vulnerabilities. This will occur after, as discussed in the Response to Recommendation 1, the DoD has developed methodologies to address aggregation of multiple sets of unclassified data where analysis across data sets can reveal national security vulnerabilities.

RECOMMENDATION 23: The GAO recommends that the Secretary of Defense develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

DoD RESPONSE: Concur. DoD is currently investigating methods to conduct gap analysis evaluations to identify instances of non-compliance. The size and complexity of the Department presents unique challenges for inventorying all research programs.

RECOMMENDATION 35: The GAO recommends that as the Subcommittee on Open Science moves forward, the Department of Defense co-chair, in coordination with other co-chairs and participating agencies, takes steps to fully implement leading practices that enhance and sustain collaboration.

DoD RESPONSE: Concur. The DoD co-chair participates in Subcommittee initiatives, including the working group on disclosure risk management, a topic of great importance to the DoD.

Accessible Text for Appendix V Comments from the Department of Education

Page 1

October 24, 2019

Mr. John Neumann

Managing Director

Science, Technology Assessment, and Analytics Government Accountability Office

441 G Street, N.W.

Washington, D.C. 20548

Dear Mr. Neumann:

I am pleased to provide the U.S. Department of Education's (Department's) response to the Government Accountability Office's (GAO's) draft report titled Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81).

As noted in the draft GAO report, the Department's Institute of Education Sciences (IES) and our colleagues in the Department have been working for several years to expand public access to publications and data from our research investments. We have significantly expanded the number of full-text scholarly publications from federally funded research available to the public at no cost through our Education Resources Information Center (ERIC), in accordance with the Office of Science and Technology Policy memorandum.[1]

On page 44 of the draft report, GAO recommended:

The Secretary of Education should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

We concur with the recommendation. As noted in this report, IES has awarded a contract to support enhancements to ERIC to link scholarly research publications supported by the Department to its publicly accessible datasets. We expect to complete this work no later than the end of fiscal year 2020 (September 30, 2020).

[1] Office of Science and Technology Policy, Increasing Access to the Results of Federally Funded Scientific Research Memorandum, (Washington, D.C.: February 22, 2013).

Page 2

Thank you for the opportunity to respond to this recommendation and provide the enclosed technical comments. If you or your staff have any questions regarding our response, please contact Dr. Elizabeth Albro, Commissioner of the National Center for Education Research, at Elizabeth.Albro@ed.gov.

Sincerely,

Mark Schneider

Director

Enclosure

Accessible Text for Appendix VI Comments from the Department of Energy

Page 1

November 8, 2019

Mr. John Neumann

Managing Director

Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street N.W.

Washington, DC 20548

Dear Mr. Neumann:

The Department of Energy (DOE or "Department") appreciates the opportunity to comment on the Government Accountability Office's (GAO) draft report titled, Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81).

The report contains 39 recommendations, of which GAO directed three recommendations to DOE. DOE concurs with each of GAO's recommendations. The Department's plan to address GAO's recommendations follows.

Recommendation 20: The Secretary of Energy should evaluate training needs for agency officials or others involved in reviewing the merits of

researchers' data management plans (DMPs) and, if additional training is found to be warranted, develop and provide such training.

DOE Response: Concur

The Department will assess and develop a plan to meet the training needs of internal DOE staff and external peer reviewers of DMPs.

Estimated Completion Date: December 31, 2020

Recommendation 29: The Secretary of Energy should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

DOE Response: Concur

GAO's recommendation for public access to scientific publications for its extramural researchers (financial assistance recipients) complements DOE's already developed and fully implemented public access plan compliance mechanism for the scholarly publications emanating from its 17 national laboratories (as noted on page 31 of draft report). DOE will develop a compliance mechanism to identify researchers receiving DOE funding from financial assistance awards (extramural researchers for purposes of the report) who are not compliant with DOE's Public Access Plan for publications.

Page 2

Using existing DOE and programmatic business processes for managing financial assistance awards, DOE will establish compliance mechanisms which will include providing the DOE program or awarding offices routine information regarding gaps in identified scholarly publications and accepted manuscripts, in accordance with the DOE Plan for their areas of responsibility. Also, as part of the existing award process, DOE's Office of Scientific and Technical Information (OSTI) will work with individual DOE program or awarding office officials on a consistent basis to address identified gaps and develop plans to acquire missing manuscripts accepted for public use. Focus areas to be addressed include: review/development of programmatic specific mechanisms, communication of requirements and training, recipient notifications as warranted, and award closeout guidelines.

Estimated Completion Date: December 31, 2020

Recommendation 36: As the Subcommittee on Open Science moves forward, the Department of Energy co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

DOE Response: Concur

The Department of Energy, as a co-chair of the Subcommittee on Open Science, is actively identifying areas of collaboration across agencies in implementing open science practices. Through both the Subcommittee and existing partnering agreements, agencies are sharing best practices and developing streamlined models for implementing public access to federal research results.

Estimated Completion Date: Ongoing

GAO should direct any questions to Judy Gilmore, Acting Director, Office of Scientific and Technical Information, at 865-576-5600, or via e-mail to gilmorej@osti.gov.

Sincerely,

Chris Fall

Director, Office of Science

Accessible Text for Appendix VII Comments from the Environmental Protection Agency

Page 1

OCT 25 2019

Mr. John Neumann

Director, Science, Technology Assessment, and Analytics

U.S. General Accountability Office

Washington, D.C. 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on GAO's draft report entitled Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81).

We are pleased to report on September 26, 2019, EPA released EPA Order 1000. I 7B, Policy for Increasing Access to Results of EPA-Funded Extramural Scientific Research1 (EPA Order). EPA Order was developed to implement the requirements outlined in the February 22, 2013 White House Office of Science and Technology Policy (OSTP) memorandum2 for extramural agreements. The EPA Order describes requirements for EPA offices that manage research through extramural assistance agreements. This was the third and final implementation phase of EPA's Plan to Increase Access to Results of EPA-Funded Scientific Research 3. With the release of the EPA Order, information in the GAO-20-81 is no longer up-to-date, both in the report and recommendations. Specifically, EPA' s information in Tables 2 and 3 of GAO-20-81 is no longer accurate and should be updated to reflect the EPA Order issuance and EPA's full implementation of EPA's Plan to Increase Access to Results of EPA-Funded Scientific Research.

EPA responses to GAO-20-81 recommendations are provided below:

Recommendation 11: The Environmental Protection Agency Administrator should complete development of data management plan requirements for extramural researchers.

Response: EPA agrees with this recommendation. With the issuance of the EPA Order, this recommendation has been completed. The EPA extramural policy requires data management plans (DMPs) be included by extramural researchers in applications /proposals submitted to EPA for funding.

[1] https:/ / www.e pa.gov/s ites/ production/fi les/ 2019 -09/ documents/order 1000 17b. pdf

[2] https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf

[3] https://www.epa.gov/sites/production/file s/2016 -12/documents/epascientificresearchtransperancyplan.pdf

Page 2

Recommendation 21: The Environmental Protection Agency Administrator should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

Response: EPA agrees with this recommendation. The agency will evaluate the training needs for agency officials who review intramural and extramural researchers' DMPs during FY 2020.

Recommendation 32: The Environmental Protection Agency Administrator should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Response: EPA agrees with the recommendation. With the issuance of the EPA Order, this recommendation has been completed. As indicated in GAO-20-81, EPA has developed and implemented a compliance process for intramural research. The EPA Order puts into place compliance measures for the third and final implementation phase of EPA's public access plan.

Thank you again for the opportunity to review and respond to the GAO's draft report, Federal Research: Additional Actions Needed to Improve Public Access to Research Results. If additional information is needed, please contact the Office of Resource Management's Maureen Hingeley at 202-564-1306 or the Office of Science Advisor, Policy and Engagement's Tom Sinks at 202-564-3099.

Sincerely,

Jennifer Orme-Zavaleta, Ph.D.

Principle Deputy Assistant Administrator and EPA Science Advisor

Accessible Text for Appendix VIII Comments from the Department of Health and Human Services

Page 1

OCT 24 2019

John Neumann

Managing Director, Science, Technology Assessment & Analytics

U.S. Government Accountability Office

441 G Street NW

Washington, DC 20548

Dear Mr. Neumann:

Attached are comments on the U.S. Government Accountability Office's (GAO) report entitled, "Federal Research: Additional Actions Needed to Improve Public Access to Research Results " (GAO-20-81).

The Department appreciates the opportunity to review this report prior to publication.

Sincerely,

Sarah Arbes

Acting Assistant Secretary for Legislation

Attachment

Page 2

Recommendation 3

The Director of AHRQ should take steps to ensure appropriate agency funded research data are readily findable and accessible to the public.

AHRO Response:

AHRQ concurs with GAO recommendation.

AHRQ has developed a draft Data Management Plan policy as the first step toward making the AHRQ funded research data available for public access. This policy will be published by January 2020. By December 2020 AHRQ will publish its policy for public access to data developed under AHRQ-funded research.

Recommendation 4

The Commissioner of FDA should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

FDA Response:

FDA concurs with GAO Recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will ensure that publicly disclosable, agency-funded research data are readily findable and accessible to the public through expansion of the FDA Library's new FindIT platform.

Recommendation 9

The Director of AHRQ should complete the development of data management plan requirements.

AHRO Response:

AHRQ concurs with GAO recommendation.

The data management plan policy will be published by January 2020.

Recommendation 15

The Commissioner of FDA should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

FDA Response:

FDA concurs with GAO Recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will collaborate with other HHS operating divisions to evaluate and, if warranted, improve FDA's data management plan (DMP) instructions and guidance as well as training of FDA personal involved in reviewing researchers ' DMPs.

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Recommendation 18

The Director of AHRQ should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' data

management plans and if additional training is found to be warranted, develop and provide such training.

AHRO Response:

AHRQ concurs with GAO Recommendation.

AHRQ will assess training needs for agency officials and others involved in reviewing the merits of researchers' data management plans and provide required training as warranted.

Recommendation 24

The Director of AHRQ should develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

AHRO Response:

AHRQ concurs with GAO recommendation.

AHRQ will develop and implement a mechanism to ensure researcher compliance with public access •plan and associated requirements. AHRQ will continue to use the NIH/PUBMED publication repository as the compliance mechanisms for the publications public access requirement and will use progress reports and final reports, such as Research Performance Progress Reports (RPPR), as part of the compliance process.

Recommendation 25

The Commissioner of FDA should develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

FDA Response:

FDA concurs GAO recommendation.

FDA will take steps to improve public access to research results over the next several years. FDA will enlarge the scope of its Library FindIT system to include analytics and reporting capabilities directed to

researchers' compliance with their public access plan and associated requirements.

Page 4

Recommendation 26

The Director of the National Institutes of Health should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

NIH Response:

NIH concurs with GAO's recommendation.

As previously provided in its responses to GAO, NIH has fully developed and implemented mechanisms to ensure researcher compliance with the publications portion of its public access plan (NIH's Public Access Policy). Regarding data, NIH has several data sharing policies and initiatives across NIH for which compliance mechanisms are in place. NIH is currently focusing its efforts on drafting an agency-wide data management and sharing policy and associated guidance that will fully implement its public access plan, including mechanisms to ensure researcher compliance. NIH anticipates releasing the draft policy and draft guidance before the end of 20I 9 for public comment, to inform the development of a final NIH data management and sharing policy. Therefore, NIH suggests that the recommendation be revised to reflect that NIH has a long-standing, fully developed compliance program for the NIH Public Access Policy for publications and is in the process of developing a policy that will fully implement its public access plan for data. NIH will provide an update in our 180-day letter response.

Recommendation 37

As the Subcommittee on Open Science moves forward, the National Institutes of Health co-chair, in coordination with other co-chairs and participating agencies, should take steps to fully implement leading practices that enhance and sustain collaboration.

NIH Response:

NIH concurs with GAO's recommendation.

As noted in the GAO draft report, with leadership from NIH, the Subcommittee on Open Science and its working groups are actively coordinating and building consensus on issues and processes to implement leading practices that enhance and sustain collaboration across federal agencies. NIH is both sharing leading practices learned from its experience with public access and learning from the successful practices of other agencies. NIH will provide an update in our 180-day letter response.

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The National Institutes of Health (NIH) appreciates the review conducted by Government Accountability Office (GAO) and the opportunity to provide technical comment on this draft report.

Page 14, Second Full Paragraph

It states that, “... NIH reported it is developing a web-based mechanism that would allow data in multiple NIH data repositories to be found and used from a central point of access." This language did not appear in the Statement of Facts, and NIH requests that the language be changed to, "NIH reported that it is developing a mechanism, using industry standard web-based technologies, to provide a federated experience for biomedical researchers to access NIH-funded data resources in the cloud."

Accessible Text for Appendix IX Comments from the Department of Homeland Security

Page 1

October 24, 2019

John Neumann

Managing Director, Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, NW

Washington, DC 20548

Re: Management Response to Draft Report GAO-20-81, "FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results"

Dear Mr. Neumann:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The Department agrees with the importance and benefits of providing public access to federally funded research results. In this regard, DHS established a publication repository through the National Institutes of Health PubMed Central (PMC) for the preservation and public access to scientific publications resulting from DHS funding, which currently includes 1,131 articles. The Department remains committed to implementing plans supporting increased public access to federally funded research, which will be managed by a DHS Public Access Advisory Group.

The draft report contained 39 recommendations, including four for DHS with which the Department concurs. Attached find our detailed response to each recommendation. DHS previously submitted technical comments under a separate cover.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact me if you have any questions. We look forward to working with you again in the future.

Sincerely,

JIM H. CRUMPACKER, CIA, CFE

Director

Departmental GAO-OIG Liaison Office

Attachment

Page 2

GAO recommended that the Secretary of Homeland Security:

Recommendation 5: Take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

Response: Concur. The Department is fully committed to the principals of open access to government funded research and development. The Science & Technology (S&T) Office of Strategy and Policy (OSP)/Knowledge Management Branch (KM) is in the process of establishing a portal on the DHS website to increase public access to agency-funded research, as appropriate. Estimated Completion Date (ECD): June 30, 2020.

Recommendation 10: Complete development of data management plan requirements.

Response: Concur. S&T OST/KM will develop a DHS-wide Management Directive and Instruction for research and development data, as well as DHS Research and Development Data Management Plan (DMP) guidance and a template to document requirements. ECD: June 30 2020.

Recommendation 16: Evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

Response: Concur. S&T OST/KM, working with the DHS Public Access Advisory Group, will evaluate training needs for the review of DMPs after completion of the DHS-wide Management Directive and Instruction, and the DMP documents discussed above. S&T will also develop plans to fulfill any additional training needs identified by this evaluation. ECD: September 30, 2020.

Recommendation 27: Develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

Response: Concur. S&T OST/KM, working with the DHS Public Access Advisory Group, will develop a mechanism to ensure researcher compliance with the DHS Public Access Plan and DMP requirements. ECD: September 30, 2020.

Accessible Text for Accessible Text for Appendix X Comments from the Department of Transportation

OCT 28 2019

John Neumann

Managing Director, Science, Technology Assessment, and Analytics

U.S. Government Accountability Office (GAO)

441 G Street NW

Washington, DC 20548

Dear Mr. Neumann:

The Department of Transportation (DOT or the Department) is committed to ensuring public access to the results of DOT-funded scientific research reports and digital datasets. The Department's Public Access plan (December 2015) is designed to drive innovation in transportation through the sharing of research publications and associated digital datasets with the public. This sharing, within DOT and with the public, enables synergies and innovations no single DOT Operating Administration can achieve on its own.

The Department has made improvements to its Public Access Policy plan implementation by establishing a Public Access Implementation Working Group. This working group, consisting of representation from each DOT Operating Administration, is currently developing a compliance mechanism for the Public Access plan.

Upon review of the draft report, we concur with recommendation 31 to fully develop and implement a mechanism to ensure researcher compliance with DOT's public access plan and associated requirements. We will provide a detailed response to the recommendation within 180 days of the final report's issuance.

We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline M. Chulumovich, Director, Audit Relations and Program Improvement, at (202) 366-6512 with any questions.

Sincerely,

Keith Washington

Deputy Assistant Secretary for Administration

Accessible Text for Appendix XI Comments from the National Science Foundation

October 15, 2019

John Neumann

Managing Director

Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, NW

Washington, D.C. 20548

Dear Mr. Neumann:

Thank you for the opportunity to review and provide comments on the Government Accountability Office (GAO) draft report*, FEDERAL RESEARCH: Additional Action Needed to Improve Public Access to Research Results* (GAO-20-81). The National Science Foundation (NSF} values the GAO staff's professionalism and many constructive interactions during this GAO engagement.

NSF appreciates GAO's acknowledgement of agency efforts to fully implement the 2013 Office of Science and Technology Policy (OSTP} memorandum, Increasing Access to the Results of Federally Funded Research. The Foundation has invested substantially in related research and community outreach since the NSF plan (NSF 15-052} was released in 2015 and continually monitors performance of the Public Access Repository (PAR). In collaboration with Department of Energy, NSF has implemented two upgrades to PAR to streamline deposit of papers, as your study acknowledges, and to support public access to workshop final reports. The Foundation is currently exploring mechanisms through PAR to enhance discoverability of data.

NSF concurs with the two recommendations made by GAO to ensure that appropriate agency- funded research data are findable and accessible and to work with other agencies on implementation of leading practices.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact Veronica Shelley at vshelley@nsf.gov or 703-292-4384 if you have any questions or require additional information. We look forward to working with you again in the future.

Sincerely,

France A. Cordova

Director

Accessible Text for Appendix XII Comments from the United States Agency for International Development

Page 1

John Neumann

Managing Director, Science, Technology-Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, N.W.

Washington, D.C. 20226

Dear Mr. Neumann:

I am pleased to provide the formal response of the U.S. Agency for International Development (USAID) to the draft report produced by the U.S. Government Accountability Office (GAO) titled, Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO 20-81).

The draft report contains two recommendations for USAID. The Agency concurs with both of the GAO's recommendations regarding the development of data-management plans and trainings for researchers. We are pleased to inform you that we are actively addressing them.

USAID is committed to open data and evidence-informed investments by constantly improving the quality and integrity of our data and adhering to the principles outlined in USAID's Public-Access Plan. USAID fully supports the requirement that Agency-funded programmatic partners who collect or acquire data must create, and adhere to, a data- management plan. We are equally committed to training our staff to assess and oversee the implementation of these plans.

USAID is currently updating the Agency's policy on data, found in Chapter 579 of the Automated Directives System (ADS), USAID Development Data, to ensure our staff require data-management plans from our extramural researchers. In addition, we have delivered training on the essentials of data-management plans during the Agency's Worldwide Program Officer Conference just this month. This training augments other data-management training sessions we have provided to om staff in the Kingdom of Cambodia, the Federal Democratic Republic of Nepal, and the Republic of The Philippines over the past twelve months.

Ultimately, USAID envisions setting up a unified portal through which our partners manage their submission of digital evidence to the Agency, including research manuscripts, underlying research data, and supporting documentation. We are making this vision a reality through the Development Info1mation Solution (DIS), an investment approved by the Office of Management and Budget (0MB) that is currently in use on a pilot basis at several of our Missions around the world.

As an example of our commitment to increasing public access to Agency-funded research, I am also pleased to repo11 that, as of last month, USAID uploaded more than 16,000 metadata records to the Development Experience Clearinghouse repository, which makes the research they represent more easily discoverable and searchable. In addition, in the next few months we plan to join World RePORT, an open-access, interactive mapping database hosted by

Page 2

the National Institutes of Health within the U.S. Department of Health and Human Services that highlights biomedical research investments and partnerships from some of the world' s largest funding organizations.

I am transmitting this letter and the enclosed comments from USAID for inclusion in the GAO's final report. Thank you for the opportunity to respond to the draft report, and for the courtesies extended by your staff

while conducting this engagement. We appreciate the opportunity to participate in the complete and thorough evaluation of our implementation of our Public-Access Plan for the research we fund.

Sincerely,

Albert Bullock

Deputy Assistant Administrator

Bureau for Management

Enclosure: a/s

Page 3

COMMENTS BY THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT ON THE DRAFT REPORT PRODUCED BY THE U.S. GOVERNMENT ACCOUNTABILITY OFFICE (GAO) TITLED, Federal Research: Additional Actions Needed to Improve Public Access to Research Results, (GAO 20-81)

The U.S. Agency for International Development (USAID) would like to thank the U.S. Government Accountability Office (GAO) for the opportunity to respond to this draft repm1. We appreciate the extensive work of the GAO engagement team. The specific findings will help USAID ensure that the public has easy access to the results of the research we fund and that researchers comply with the Agency's public-access requirements.

The draft report contains two recommendations for USAID. The Agency agrees with both recommendations, and is already addressing them.

1. The U.S. Agency for International Development Administrator should complete development of data-management plan (DMP) requirements for extramural researchers. (Recommendation 12)

USAID is committed to ensuring that Agency-funded data are publicly available, and is taking specific measures to fulfill this promise. As an example of our commitment to increasing public access to Agency-funded research, as of September 2019 USAID has uploaded more than 16,000 metadata records to the Development Experience Clearinghouse repository, which makes the research they represent more easily

discoverable and searchable. In addition, in the next few months we plan to join World RePORT, an open-access, interactive mapping database hosted by the National Institutes of Health within the U.S. Department of Health and Human Services that highlights biomedical research investments and pa11nerships from some of the world's largest funding organizations.

USAID is developing standardized guidance to implement the DMP requirements for all future research programs globally. For research activities and others funded by USAID that collect, acquire, or otherwise generate data, the Agency will require that partners submit DMPs and receive approval before they gather data. The Agency is making substantial revisions to its data policy, found in Chapter 579 of the Automated Directives System (ADS), USAID Development Data. These amendments will direct USAID's staff to include the submission of a DMP as an essential element of all new programs, which will bolster public access to Agency-funded research results, and incorporate additional measures to ensure compliance with the Foundations for Evidence-Based Policymaking Act. In the interim, as noted in the GAO report, some USAID Operating Units have started implementing their own DMP requirements.

In the near future, USAID envisions a unified po11al through which our pat1ners can manage their submission of digital evidence to the Agency, to include research manuscripts, underlying research data, and supporting documentation. We are making this vision a reality through the Development Information Solution (DIS), an investment approved by the Office of Management and Budget (0MB) that is currently in use on a pilot basis at several of our Missions around the world.

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USAID's Office of the Chief Information Officer (CIO) in the Bureau for Management (M) will be responsible for ensuring the implementation of this recommendation, and will initiate the steps above within 12 months of issuance of the GAO's final repo1t.

2. The U.S. Agency for International Development Administrator should complete development of and provide training for agency officials or others involved in reviewing the merits of researchers' DMPs. (Recommendation 14)

USAID recognizes the importance of training the staff who oversee the DMP process. USAID Data Services within the Office of the CIO in the M Bureau is currently refining an expansive Data-Literacy Training Program that involves the development of both in-person classwork and a series of highly interactive e-Learning modules with various multimedia resources. The curriculum includes a Certification Program that will create a path for career advancement and professional growth in data science within USAID.

USAID Data Services will provide training and guidance on the development and evaluation of DMPs for the Agency's officials and stakeholders. To reach a broad audience efficiently, Data Services will develop an e-Learning series that addresses the creation, submission, evaluation, and approval of DMPs. The e-Learning series curriculum will build on existing material on data- management planning previously developed with, and delivered to, USAID's Global Health staff. It will also leverage other training materials in data-management planning presented to USAID staff at several Agency Missions and at the 2019 Worldwide Program Officer Conference.

USAID' s Office of the CIO in the M Bureau will be responsible for ensuring the implementation of this recommendation, and will initiate the steps above within 12 months of the issuance of the GAO's final report.

Additional Technical Comment: On page 18 of the draft report, in Table 2, titled, "Agency- Reported Data-Management Plan (DMP) Requirements as of August 2019," the row for USAID contains a footnote in the column headed, "DMP requirement for intramural researchers." The footnote says, "Agency funds either intramural or extramural research." Please note that USAID does not fund intramural research; the Agency only funds extramural research. Further, we recommend that the GAO move footnote "f' to column 3 with the header, "DMP requirement for extramural researchers."

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CLEARANCE PAGE for USAID Comments on GAO Draft Report titled, Public Access to Federally Funded Research Results, (GAO 20-81)

Clearances:

Jay Mahanand */Si* 10/7/2019

Bureau/IO	Clearance Status	Date
GAO-L: GYang	Clear	10/11/19
Dep CFO (Overseas):I<Body	INFO	10/11/19
GC (Acting): MCohen	Clear	10/7/19
SDAA/LPA Eddy Acevedo	Clear	10/11/19
PPL/Audit: GYang	Clear	10/11/19
DAA/M: AEL-ABD	Clear	10/11/19
AA/M: FNutt	Clear	10/11/19
ES: MYoung	Clear	10/18/19
ES: EBakely	Clear	10/18/19
ES: ECalT	Clear	10/21/19
ES: AHarvey	Clear	10/21/19
FO: BPichanick	INFO	10/21/19

cc:

Audit Analysts

Drafter: M:Brandon Pustejovsky: 703-666-5643; October 1, 2019

Accessible Text for Appendix XIII Comments from the United States Department of Agriculture

November 4, 2019

Mr. John Neumann

Managing Director, Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, NW

Washington, D.C. 20548

Mr. Neumann:

The U.S. Department of Agriculture (USDA) appreciates the opportunity to respond to the U.S. Government Accountability Office (GAO) draft report "FEDERAL RESEARCH: Additional Actions Needed to Improve

Public Access to Research Results, GAO Report Number GAO-20-81" dated November 2019.

USDA agrees with the findings in the GAO draft report. All stylistic and substantive issues with the report have been resolved in earlier reviews with the GAO leads.

Thank you again for the opportunity to review and respond to the GAO draft report.

Sincerely,

Scott H. Hutchins, Ph.D.

Deputy Under Secretary

Research, Education, and Economics

Accessible Text for Appendix XIV Comments from the Department of Veterans Affairs

Page 1

Mr. John Neumann Managing Director

Science, Technology Assessment, and Analytics

U.S. Government Accountability Office

441 G Street, NW

Washington, DC 20548

Dear Mr. Neumann:

The Department of Veterans Affairs (VA) has reviewed the Government Accountability Office (GAO) draft report: FEDERAL RESEARCH: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81).

The enclosure contains general comments and sets forth the actions to be taken to address the draft report recommendations.

VA appreciates the opportunity to comment on your draft report.

Sincerely,

Pamela Powers

Chief of Staff

Enclosure

Page 2

General Comments:

The Department of Veterans Affairs (VA), through the Veterans Health Administration's (VHA) Office of Research and Development (ORD), has been committed to the principles and practice of public access to research results, now more commonly referred to as Open Science. In addition to early adoption of requirements for the registration and subsequent inclusion of results from ORD funded clinical trials (see https://doi.org/10.1016/j.cct.2017.04.002), VA currently has over 16,000 publications included in the PubMed Central database.

VA has also taken steps toward establishing a framework and capacity for making data sets available to investigators. The ORD Cooperative Studies Program has established a clearinghouse as a way to help qualified researchers access epidemiologic research data. As an effort that began in 2018, a curated list of VA and non-VA funded studies involving Veterans can be searched for additional information to generate new opportunities for research. This activity is called the Integrated Veteran Epidemiologic Study Data Resource and can be found at https://www.vacsp.research.va.gov/CSPEC/Studies/INVESTD-R/Main.asp. It contains information on nearly 70 study databases and continues to add to this collection.

VA will continue to work with its partners, including the Office of Information and Technology, Office of Enterprise Integration, and other groups to determine opportunities to obtain and leverage resources to grow existing efforts and/or create new capabilities to facilitate public access to research results.

Page 3

Recommendation 1: The Secretary of Veterans Affairs should take steps to ensure appropriate agency-funded research data are readily findable and accessible to the public.

VA Comment: Concur. Through the Veterans Health Administration's (VHA) Office of Research and Development (ORD), the Department of Veterans Affairs (VA) has been an active participant in Federal efforts related to Open Science and to make agency-funded research data readily findable and accessible to the public. As noted in the report, VA efforts have focused on having its publications included in the National Institutes of Health-supported PubMed Central repository (see https://www.ncbi.nlm.nih.gov/pmc/funder/va/) with over 16,000 publications currently included. Additionally, summary data from all VHA ORD funded clinical trials are submitted to Clinicaltrials.gov.

VA continues to work with its Federal partners as part of larger efforts, such as Open Data, towards enhancing how research data are readily findable and accessible to the public. Additionally, further opportunities to achieve the goals of Open Science will be identified through the intra-agency Data Governance Council - co-chaired by the Offices of Information and Technology and Enterprise Integration. VA has completed actions on this recommendation and requests the Government Accountability Office (GAO) consider closure.

Recommendation 2: The Secretary of Veterans Affairs should evaluate training needs for agency officials or others involved in reviewing the merits of researchers' DMPs and, if additional training is found to be warranted, develop and provide such training.

VA Comment: Concur. ORD has implemented requirements for inclusion of Data Management Plans (DMP) as a condition of funding. However, as a relatively new practice for several agencies, there are opportunities to learn how to continually improve this effort. Training is a key part of this process and ORD will seek out needs and opportunities to train program staff and reviewers involved in the scientific review process. In addition to identifying other strong practices among other agencies, VA will meet with program staff to discuss needs and how to better consider the merit of investigator submitted DMPs. Activities envision a phased approach that takes into consideration the fact that ORD scientific review of investigator submissions occur throughout the year and are managed by multiple services within ORD. Additionally, a similar recommendation was made to

other agencies, including the Agency for Healthcare Research and Quality and Department of Defense. Therefore, there may be further opportunities to determine how similar practices/tools for compliance can be adopted. Target Completion Date: September 30, 2020.

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Recommendation 3: The Secretary of Veterans Affairs should fully develop and implement a mechanism to ensure researcher compliance with their public access plan and associated requirements.

VA Comment: Concur. VA continues to be committed to the principles and practice of Open Science for its funded research activities. Given this commitment, ORD has established mechanisms to help with ensuring compliance with its public access plans. These items include requirements for providing DMP and registration of funded clinical trials in Clinicaltrials.gov (see https://doi.org/10.1016/j.cct.2017.04.002). VA has completed actions on this recommendation and requests GAO consider closure.

(102451)

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