



February 2023

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Improved Workforce Planning Needed to Address Recruitment and Retention Challenges

Accessible Version

GAO Highlights

Highlights of [GAO-23-105521](#), a report to the Honorable Roger F. Wicker, United States Senate

Why GAO Did This Study

Within the Department of Commerce, NIST relies on a highly specialized S&T workforce to support its mission for advancing technology and providing measurement services and standards that promote U.S. innovation and industrial competitiveness. NIST competes with the private sector and academia for talent such as physicists, chemists, and engineers. Agencies across the federal government have struggled to identify skills gaps and the future needs of their scientific and technical staff.

GAO was asked to review NIST's recruitment and retention of S&T staff. This report examines (1) challenges NIST faces in recruiting and retaining a diverse, highly qualified S&T workforce and (2) the extent to which NIST has implemented leading human capital practices to address its challenges.

GAO reviewed NIST documentation and data on its workforce, and interviewed NIST hiring managers and human capital agency officials. GAO also compared NIST practices to selected leading practices in human capital management that relate to NIST's challenges.

What GAO Recommends

GAO is making three recommendations: that NIST (1) track how often flexibilities have been used—including how often incentive payments have been offered and paid—to evaluate their success, (2) develop a succession planning framework, and (3) develop an agency-wide strategic workforce process. The Department of Commerce concurred with the recommendations.

View [GAO-23-105521](#). For more information, contact Candice N. Wright, 202-512-6888, WrightC@gao.gov

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Improved Workforce Planning Needed to Address Recruitment and Retention Challenges

What GAO Found

The National Institute of Standards and Technology (NIST) has a workforce of approximately 3,400, including a cadre of scientific and technical (S&T) staff. GAO found NIST faces recruiting and retention challenges that affect the entire employee lifecycle for its S&T workforce. Such challenges include:

- **Competition.** NIST faces competition for a highly specialized pool of candidates and declining applications from a postdoctoral program that is a key recruitment pipeline.
- **Pay.** NIST's pay and other flexibilities are not competitive with private sector employers who, in some cases, may offer salaries up to three times higher.
- **Culture.** NIST reports identified gender-related imbalances in career advancement and leadership roles, as well as an unwelcoming environment for women that may cause some to leave.
- **Succession.** NIST has a small, specialized workforce with unique institutional knowledge that is difficult to replace in a timely manner.

NIST has fully implemented two, partially implemented seven, and not implemented one of 10 selected leading practices for managing human capital that GAO reviewed related to the challenges NIST faces. For example, NIST has fully implemented a leading practice on holding management accountable for diversity initiatives. NIST requires supervisors to demonstrate commitment to valuing diversity as part of supervisors' performance appraisals. In other cases, NIST has yet to take action to fully implement other selected leading practice (see table).

NIST uses several flexibilities, such as incentive payments, to keep critical personnel. Yet NIST does not track those or measure the effectiveness of its recruitment and retention incentives to enable a strategic approach to leverage such flexibilities. Further, NIST takes steps to prepare for personnel changes such as tracking retirement eligibility and mentoring staff. However, NIST does not yet have an agency succession planning process and has not yet implemented the Department of Commerce's succession planning framework.

Moreover, NIST does not assess skills gaps or develop strategic workforce plans that link recruiting, succession, or human capital plans to workforce planning efforts. An agency-wide workforce planning process aligned with NIST's strategic goals would help managers ensure the agency's workforce has needed skills and avoids program disruptions that can occur when skills gaps exist.

NIST Implementation of Selected Leading Practices for Human Capital Management

Workforce Area	Selected Leading Practice	NIST implementation of leading practices
Recruiting a Specialized Workforce	Develop an agency brand or branding strategies to build credibility with employees and potential applicants.	partially implemented
Recruiting a Specialized Workforce	Cultivate a diverse talent pipeline by building relationships and developing strategic partnerships with a range of institutions and organizations.	partially implemented
Competing for a Highly Qualified Workforce	Strategically leverage available payment authorities and hiring flexibilities.	partially implemented
Competing for a Highly Qualified Workforce	Provide employees with career development and training.	fully implemented
Fostering an Inclusive Culture	Hold management accountable for the progress of diversity initiatives.	fully implemented
Fostering an Inclusive Culture	Use quantitative and qualitative measures to evaluate the effectiveness of the organization's diversity management efforts and the progress it is making in those efforts.	partially implemented
Maintaining Institutional Knowledge	Maintain an ongoing succession planning process for identifying and developing a diverse pool of talent for an organization's potential future leaders.	partially implemented
Maintaining Institutional Knowledge	Link succession planning and training efforts, such as for leadership development programs that are targeted to help address specific challenges related to diversity, leadership capacity, and retention.	partially implemented
Workforce Planning	Develop strategies and plans to address gaps in competencies and staffing.	partially implemented
Workforce Planning	Establish and maintain a strategic workforce planning process.	not implemented

Legend: ○=not implemented ◐=partially implemented, ●=fully implemented

Source: GAO analysis of National Institute of Standards and Technology (NIST) human capital management practices. | GAO-23-105521.

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Abbreviations

Commerce	Department of Commerce
DEIA	Diversity, Equity, Inclusion, and Accessibility
DEIO	Diversity, Equity, and Inclusivity Office
DHA	Direct-Hire Authority
EEOC	Equal Employment Opportunity Commission
FY	fiscal year
HR	human resources
IAAO	International and Academic Affairs Office
NASEM	National Academies of Sciences, Engineering, and Medicine
NIST	National Institute of Standards and Technology
NRC	National Research Council
OHRM	Office of Human Resources Management
OPM	Office of Personnel Management
S&T	science and technology
STEM	science, technology, engineering, and mathematics

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February 28, 2023

The Honorable Roger F. Wicker
United States Senate

Dear Mr. Wicker:

The National Institute of Standards and Technology (NIST), an agency of the Department of Commerce's (Commerce), is responsible for creating measurement services and tools and helping develop and maintain key measurement and documentary standards. NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. In order to achieve its mission, NIST needs a cadre of highly-specialized science and technology (S&T) staff in its labs such as physicists, chemists, engineers, IT specialists, technicians, and others. These staff are responsible for advancing the technology, measurement, and standards that enable smart electric power grids, electronic health records, atomic clocks, and advanced nanomaterials, among others. Individuals with such expertise are in limited supply and often in high demand in the public and private sectors. In its most recent Strategic Plan issued in 2020, NIST underscored the need to access and recruit talent in a highly competitive marketplace to stay at the forefront of research and innovation.

The federal government has historically faced challenges competing with the private sector and other employers for S&T staff. Federal government pay is often not competitive with pay offered in the private sector. Also, NIST may not regularly offer flexibilities, such as full-time telework options, that are increasingly prevalent in the private sector. We have designated strategic human capital management as a government-wide high-risk area in part because of the need to address current and emerging skills gaps that undermine agencies' abilities to achieve their missions.¹ We have previously found that agencies across the federal

¹Strategic human capital management refers to the talent management activities, such as robust workforce planning and training, that agencies conduct to address challenges in the federal workforce, including skills gaps. See GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, [GAO-21-119SP](#) (Washington, D.C.: Mar. 2, 2021).

government have struggled to identify skills gaps and the future needs of their scientific and technical staff.²

Additionally, the federal government workforce is aging and attempting to attract a more diverse workforce that better reflects the nation. An aging workforce will raise the need for new employees in the near future. Further, a diverse workforce can be beneficial in solving complex problems and lead to better performance, and more Black or African American, Hispanic or Latino, and Asian people now participate in the federal workforce than in prior years. NIST also recognizes the need to strengthen its ability to attract and retain a diverse and inclusive talent base in its Strategic Plan for fiscal years (FY) 2020 to 2025.

You asked us to review NIST's ability to recruit and retain the S&T staff it needs given the rapid pace of technological development.³ The report examines 1) challenges NIST faces in recruiting and retaining a diverse, highly qualified scientific and technical workforce and 2) the extent to which NIST has implemented leading human capital practices to address its recruitment and retention challenges. To identify challenges, we reviewed NIST human capital studies and conducted 26 interviews with agency officials, including two group interviews with hiring managers and Human Resources (HR) Specialists. We also reviewed agency demographic workforce data to gain insights on the size and composition of NIST's workforce and Federal Employee Viewpoint Survey reports to gain insights on employee satisfaction. To determine how NIST responds to its recruitment and retention challenges and the extent to which NIST

²GAO, *Science and Technology: Strengthening and Sustaining the Federal Science and Technology Workforce*, [GAO-21-461T](#) (Washington, D.C.: March 17, 2021).

³Senator Wicker's request was in his role as Ranking Member of the Committee on Commerce, Science, and Transportation in the 117th Congress.

follows leading practices, we compared its practices to selected leading practices in human capital management.⁴

We conducted this performance audit from October 2021 to February 2023 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

NIST executes its measurement services and documentary-standards development activities primarily across six laboratories and has locations in Gaithersburg, Maryland, and Boulder, Colorado. As of 2022, it has approximately 3,400 staff, as well as 3,800 associates—guest researchers, research associates, contractors, and other non-NIST employees—who collaborate with NIST staff on research projects of mutual interest.

NIST has several key offices that aid in recruiting and retention efforts:

- Office of Human Resources Management (OHRM): provides a variety of human resources services and solutions to assist in recruiting and retaining NIST employees. OHRM coordinates internally with NIST hiring managers to manage the workforce as well as with Commerce's human capital office to collaborate on human capital initiatives and the Office of Personnel Management (OPM) to share workforce data. Within OHRM, HR Specialists assist hiring managers with developing job postings, reviewing qualifications for candidates, conducting pre-

⁴Selected leading practices in human capital management came from GAO, *Federal Workforce: Key Talent Management Strategies for Agencies to Better Meet Their Missions*, [GAO-19-181](#) (Washington, D.C.: Mar. 28, 2019); *U.S. Secret Service: Action Needed to Address Gaps in IT Workforce Planning and Management Practices*, [GAO-19-60](#) (Washington, D.C.: Nov. 15, 2018); *Federal Workforce: Additional Analysis and Sharing of Promising Practices Could Improve Employee Engagement and Performance*, [GAO-15-585](#) (Washington, D.C.: July 14, 2015); *Diversity Management: Expert-Identified Leading Practices and Agency Examples*, [GAO-05-90](#) (Washington, D.C.: Jan. 14, 2005); *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington, D.C.: Mar. 1, 2004); and Office of Personnel Management, *End to End Hiring Initiative* (Washington, DC: March 2017).

employment suitability screening, and assembling offer packages. OHRM recently hired a Strategic Recruitment Program Manager, who is tasked with developing and implementing an agency-wide recruiting strategy to improve NIST's ability to attract a highly qualified and diverse workforce.

- NIST S&T staff primarily work in its six laboratories: the Communications Technology Laboratory, Engineering Laboratory, Information Technology Laboratory, Material Measurement Laboratory, NIST Center for Neutron Research, and Physical Measurement Laboratory. Supervisors within these laboratories often serve as hiring managers and work with HR Specialists on several aspects of the hiring process, including identifying the hiring need, developing the position description, performing outreach to potential candidate pools, and selecting candidates for positions.
- The International and Academic Affairs Office (IAAO): provides advice on international S&T engagement and serves as the liaison with the international S&T community. IAAO also oversees NIST's cooperation with academia; and is the focal point for dispersing information regarding NIST's student and postdoctoral programs, cooperative education activities, and education outreach efforts. Formal academic programs include the NIST Postdoctoral Research Associateship Program, the Graduate Student Measurement Science and Engineering Fellowship Program, the Professional Research Experience Program, the Summer Undergraduate Research Fellowship Program, and the Summer High School Internship Program.

NIST Career Paths and Pay

Most NIST employees are covered by its Alternative Personnel Management System (personnel system), a pay for performance system in which employees are grouped by career path and pay band.⁵ NIST's

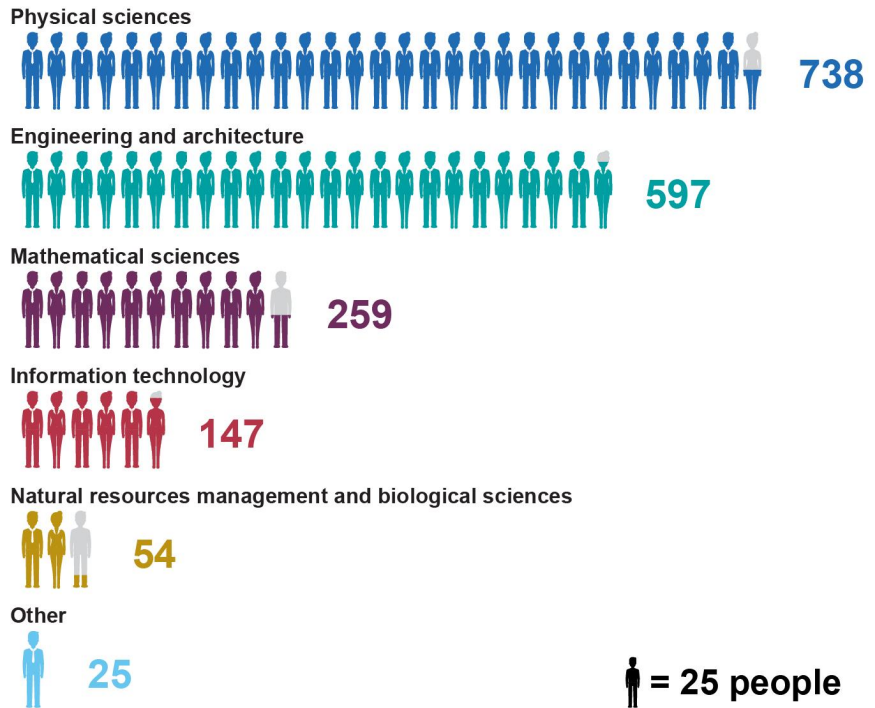
⁵National Bureau of Standards Authorization Act for Fiscal Year 1987, Pub. L. No. 99-574, 100 Stat. 3236 (1986) initially authorized this as a personnel management demonstration project under 5 U.S.C. 4703. Under Section 10(b)(10) of the law, "the methods of establishing qualification requirements for, recruitment for, and appointment to positions shall, at the discretion of the [NIST] Director, include methods involving direct examination and hiring." Congress subsequently extended this demonstration project indefinitely under National Technology Transfer and Advancement Act of 1995, Pub. L. No. 104-113, 110 Stat. 775 (1996). (codified at 15 U.S.C. § 275 note).

S&T workforce comprises employees in its scientific, engineering, and technician career paths. These employees are classified in occupational series such as computer science, physics, chemistry, physical science, mechanical engineering, information technology, and more.⁶ See Figure 1 for a breakdown of the different occupational groups in NIST's S&T workforce. Under NIST's personnel system, pay for such employees ranged from \$31,305-\$176,300 for the scientific and engineering career path and \$31,305-\$138,868 for the scientific and engineering technician career path in FY 2022.⁷ Under NIST's personnel system, hiring managers have the authority to offer flexible starting salaries. Additionally, NIST's pay for performance structure intends to provide an opportunity for high performing employees to receive pay that is more competitive.

⁶Occupational Group is defined as a major subdivision of the General Schedule, embracing a group of associated or related occupations; e.g., the Engineering and Architecture Group. Occupational Series is defined as a subdivision of an occupational group consisting of positions similar as to specialized line of work and qualification requirements. Series are designated by a title and number such as the Microbiology Series, GS-403.

⁷Pay ranges apply to staff in the Washington-Baltimore-Arlington, DC-MD-VA-WV-PA locality and could vary for other localities.

Figure 1: Scientific and Technical Occupational Groups at NIST



Source: GAO analysis of data from the National Institute of Standards and Technology (NIST), Office of Human Resources Management (data). sapannpix/stock.adobe.com (images). | GAO-23-105521

Accessible Data for Figure 1: Scientific and Technical Occupational Groups at NIST

Occupational Categories 2021	
Occupational Code	Total
Physical sciences	738
Engineering and architecture	597
Mathematical sciences	259
Information technology	147
Natural resources management and biological sciences	54
Other	25

NIST has five pay bands. Band I represents the lowest range of pay while Band V represents the highest. At the Band IV level, staff may be supervisory or non-supervisory. Management-level positions are typically classified at Band V, though S&T staff have the ability to reach Band V

without additional management responsibilities. According to NIST data, 978 of 2,278 S&T employees as of October 2022 are pay-capped at the top of their band, meaning their salary cannot increase any further.

NIST Workforce Hiring Authorities and Relevant Executive Orders

Title 5 of the U.S. Code includes a set of personnel provisions that apply to much of the federal government’s civil service system.⁸ Similar to other agencies, NIST may hire through the competitive service, where applicants undergo a competitive examination process that requires agencies to (1) notify the public that the government will accept job applications for a position, (2) screen applications against minimum qualification standards, (3) apply selection priorities such as veterans’ preference, and (4) assess applicants’ relative competencies—knowledge, skills, and abilities—against job-related criteria. As with other agencies, NIST may make excepted service appointments when it is neither feasible nor practical to use the competitive examination process.⁹ In addition, NIST has access to other hiring options that may streamline the competitive examination process. For example, NIST may use other hiring authorities, including Direct-Hire Authority, for categories of occupations where there is a severe shortage of candidates or a critical hiring need, as well as special hiring authorities for veterans and individuals with disabilities.¹⁰ NIST can also use the Intergovernmental Personnel Act Mobility program, which permits agencies to provide temporary assignment of personnel between the federal government and state and local governments, colleges and universities, and other eligible

⁸Federal civil service employees, other than those in the Senior Executive Service, are employed in either the competitive service, 5 U.S.C. §2102, or the excepted service, 5 U.S.C. § 2103.

⁹See 5 U.S.C. §§ 1104, 3301, 3302; 5 C.F.R. § 6.1.

¹⁰A Direct-Hire Authority (DHA) enables an agency to hire, after public notice is given, any qualified applicant without regard to 5 U.S.C. §§ 3309-3318, 5 CFR part 211, or 5 CFR part 337, subpart A. A DHA expedites hiring by eliminating competitive rating and ranking, veterans’ preference, and “rule of three” procedures. See OPM Direct Hire Authority Fact Sheet, available at <https://www.opm.gov/policy-data-oversight/hiring-information/direct-hire-authority/#url=Fact-Sheet>, last accessed on December 16, 2022.

organizations.¹¹ Additionally, NIST may hire employees for term positions of up to 6 years.

Moreover, NIST must consider Executive Orders as it navigates its recruiting and retention efforts. Specifically, Executive Order 14035 instructs agencies to strengthen the federal workforce by promoting diversity, equity, inclusion, and accessibility.¹² In response to the Executive Order, NIST issued its Diversity, Equity, Inclusion and Accessibility (DEIA) Strategic Plan, which outlines planned actions to improve its DEIA posture.¹³ NIST outlined plans to take conduct targeted recruitment and outreach activities to underrepresented communities.

NIST Faces Challenges Recruiting and Retaining a Diverse and Highly Qualified Workforce

We identified four challenges that affect the entire employee lifecycle:

- **Competition.** NIST faces competition for a highly specialized pool of candidates and declining applications from a postdoctoral program that is a key recruitment pipeline.
- **Pay.** NIST's pay and other flexibilities are not competitive with private sector employers who, in some cases, may offer salaries up to three times higher.
- **Culture.** NIST reports identified gender-related imbalances in career advancement and leadership roles, as well as an unwelcoming environment for women.
- **Succession.** NIST has a small, specialized workforce with unique institutional knowledge that is difficult to replace in a timely manner.

¹¹Intergovernmental Personnel Act of 1970, Pub. L. No. 91-648, 84 Stat. 1909 (1971), as amended, codified at 5 U.S.C. §§ 3371-3375. The Intergovernmental Personnel Act's Mobility Program provides for the temporary assignment of personnel between the federal government and state and local governments, colleges and universities, Indian tribal governments, federally-funded research and development centers, and other eligible organizations.

¹²Exec. Order No. 14035, 86 Fed. Reg. 34,593 (June 30, 2021).

¹³National Institute of Standards and Technology, *Diversity, Equity, Inclusion, and Accessibility Strategic Plan, FY22-FY24* (Gaithersburg, MD: July 2022).

NIST Recruits from a Specialized Pool of Candidates and a Key NIST Recruitment Pipeline Is Dwindling

Due to the nature of its scientific and technical work, NIST competes with other employers for a small and highly specialized pool of candidates who have relatively rare or multidisciplinary expertise.

Officials from most labs said it is difficult to recruit candidates from specialized fields, and furthermore, some positions require a level of experience or certification that can take years to attain. For example, when hiring for positions in health physics, officials said they look for candidates who have a master's degree and passed a certification exam, which requires a minimum of 5 years of experience. Only eight people in the U.S. passed the certification exam in one recent year, according to one hiring manager. In other specialized fields, there may be no degree or certification to signal expertise. For example, officials said that when hiring candidates to work on fundamental chemical metrology projects—which supports the nation's reference laboratory for chemical compositional measurements and standards—they must hire chemists and then train them in chemical metrology since there is no degree offered in the subject.¹⁴

NIST's work may also require multidisciplinary skills that can be difficult to capture in federal human resources systems. Multiple officials said it was difficult to recruit candidates with the multidisciplinary skill sets they need. For example, one hiring manager highlighted the need to hire a data scientist with an engineering or physics background, but noted it is difficult to find applicants with that particular combination of skills. Another hiring manager noted difficulties in hiring technical specialists who also have expertise in project management and public policy. Part of this difficulty is due to federal hiring procedures that require agencies to classify open positions within an occupational series pre-defined by OPM. Some multidisciplinary positions, such as digital services positions that combine elements of data science and traditional sciences, may not fall within a defined series. In these cases, NIST hiring managers use an occupational series that may not be descriptive of the position they are seeking to fill and, in turn, may not attract the needed candidate pool.

¹⁴Metrology is the science of measurement and its application. According to NIST, nearly all NIST research includes a metrology component.

Additionally, the federal hiring process has been difficult for applicants to navigate (see textbox for more information).

The Federal Hiring Process Can be Difficult for Applicants to Navigate

The federal government historically has faced challenges with its hiring process. According to the Office of Personnel Management's End-to-End Hiring Initiative, federal applicants regularly report confusion about complex application requirements that are difficult to meet, and lack of communications about the hiring process and applicant's status. Human Resources (HR) professionals express frustration at delays in decision-making that slow the process, and managers complain that HR policies and procedures are unclear. Such issues affect the National Institute of Standards and Technology as well, according to officials.

Source: GAO analysis. | GAO-23-105521

According to OHRM officials, the hiring manager and HR Specialists can work together to determine the appropriate occupational series to meet NIST's multidisciplinary staffing needs, but hiring managers said they still face difficulty knowing which group of job seekers to target. We previously reported that most federal HR systems only identify employee skills and competencies by their occupation series, job title, and grade. This level of detail does not adequately address the multidisciplinary nature of modern work.¹⁵

Furthermore, NIST faces challenges attracting talent due to its limited brand recognition and the nature of its measurement services work, which may not be attractive to all qualified candidates. NIST's strategic recruitment program manager said it is difficult to attract candidates who do not already know about NIST and its mission. Additionally, multiple hiring managers said it can be hard to attract people to standards and measurement services work if candidates do not find NIST's work compelling. We previously reported that agencies can highlight agency mission to help attract and acquire talent, and to help counter negative perceptions of federal work.¹⁶

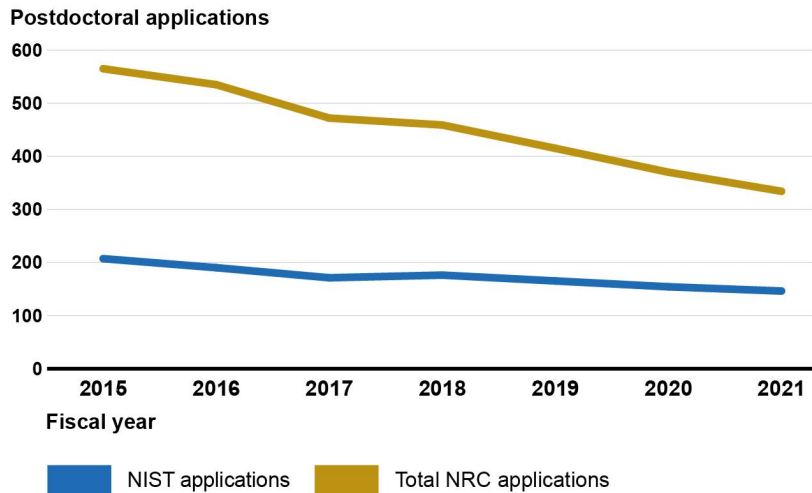
Compounding the challenge of a small candidate pool, one of NIST's talent pipelines has experienced declining applications. The National Research Council (NRC) Postdoctoral Program brings research scientists and engineers to perform advanced research at federal agencies such as NIST, and is a key talent pipeline for most NIST labs. Postdoctoral

¹⁵GAO, *Federal Workforce: Key Talent Management Strategies for Agencies to Better Meet Their Missions*, [GAO-19-181](#) (Washington, D.C.: Apr. 29, 2019).

¹⁶[GAO-19-181](#).

researchers serve on excepted service appointments for up to 2 years with the potential for subsequent conversion to term or permanent employment through a competitive hiring process.¹⁷ However, applications to the NRC Postdoctoral Program have declined from 2015 to 2021 (see fig. 2). At the same time, while the candidate pool is small compared to the workforce in general, the number of science, technology, engineering, and mathematics (STEM) doctoral graduates has grown. From 2015 to 2019, doctorates awarded in STEM fields to U.S. citizens or permanent residents increased from 24,518 graduates to 25,678. From 2019 to 2020, the total number of STEM doctoral graduates decreased slightly to 24,943, but still remained above the 2015 total. However, from 2015 to 2021, the number of national applications to the NRC Postdoctoral Program decreased from 565 to 334, and the number of NIST-specific applications decreased from 207 to 145.

Figure 2: National Research Council (NRC) Postdoctoral Applications, Fiscal Years 2015 through 2021



Source: GAO analysis of postdoctoral data from the National Academies of Sciences, Engineering, and Medicine and the National Institute of Standards and Technology (NIST). | GAO-23-105521

¹⁷Some NRC Postdoctoral Program researchers are hired as contractors and guest researchers.

Accessible Data for Figure 2: National Research Council (NRC) Postdoctoral Applications, Fiscal Years 2015 through 2021

Year	NIST Applications	Total NRC Postdoctoral Applications
2015	207	565
2016	190	535
2017	171	472
2018	176	459
2019	165	415
2020	154	370
2021	146	334

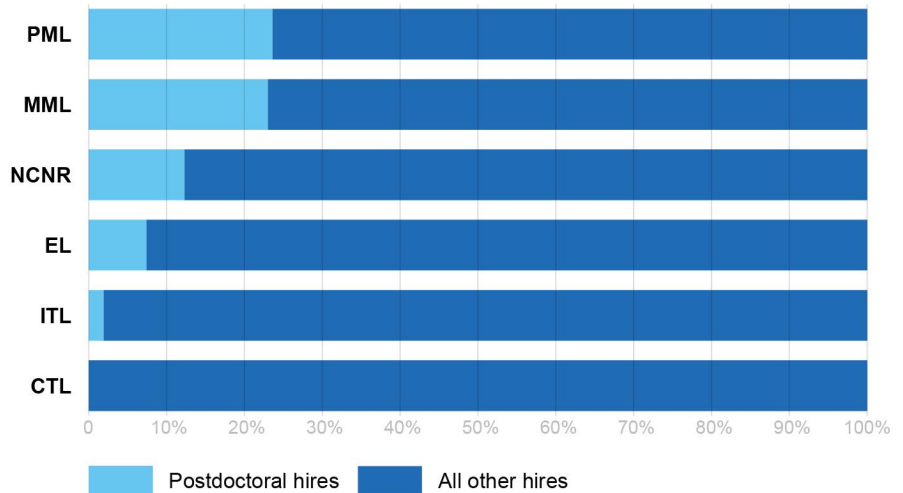
The decline in applications to the program also restricts one potential source for increasing NIST’s diversity. As of 2021, NIST reported there were 441 women in S&T positions and 1,379 men in S&T positions. The number of NRC Postdoctoral Program applications from women decreased from 60 in FY 2015 to 40 in FY 2021. Meanwhile, the number of women who received STEM doctorates ranged from 17,467 in 2015 to 18,121 in 2020.

NIST labs rely on the NRC Postdoctoral Program to hire entry-level S&T employees to varying extents. While applications have decreased, NIST has awarded a steady number of NRC Postdoctoral positions, ranging from 51 in FY 2015 to 59 in FY 2021, according to NIST data. From FY 2017 to 2021, all six labs received postdoctoral researchers through the NRC Postdoctoral Program, and all but the Communications Technology Laboratory subsequently converted at least one postdoctoral researcher to a career conditional or term appointment.¹⁸ Specifically, during the 5-year period, 124 out of 271 postdoctoral researchers (46 percent) were converted from the NRC Postdoctoral Program into permanent or term employees. See figure 3 for more information on how the different NIST

¹⁸According to the OPM, permanent employees are typically hired under career conditional appointments whereas temporary employees may be hired under term or temporary appointments that last up to 4 years. NIST can implement a term appointment with a minimum duration of more than 1 year that may be extended up to 6 years, for research positions in the S&T career path at the pay band III-level and above. 87 Fed. Reg. 25,222 (Apr. 28, 2022).

labs have used the NRC Postdoctoral Program to hire staff from FY 2017 to 2021.

Figure 3: National Institute of Standards and Technology Postdoctoral Hires and Total Hires, Fiscal Year 2017-2021



Source: GAO analysis of National Institute of Standards and Technology (NIST), Office of Human Resources Management data. | GAO-23-105521

Accessible Data for Figure 3: National Institute of Standards and Technology Postdoctoral Hires and Total Hires, Fiscal Year 2017-2021 (Postdocs hired as a percentage of new hires, by lab, 5-year average)

Lab	Postdoctoral hires (percentage of all hires)	All other hires (percentage)
PML	23.6	76.4
MML	23	77
NCNR	12.3	87.7
EL	7.4	92.6
ITL	1.9	98.1
CTL	0	100

Note: Scientific and technical staff are hired into NIST's six laboratories: the Communications Technology Laboratory (CTL), Engineering Laboratory (EL), Information Technology Laboratory (ITL), Material Measurement Laboratory (MML), NIST Center for Neutron Research (NCNR), and Physical Measurement Laboratory (PML).

According to officials from the Information Technology Laboratory, the NRC program allows NIST to assess a candidate's capabilities while giving the candidate exposure to NIST's research and workplace. Without such a program in place, it can be difficult for candidates to understand

NIST's workplace and similarly difficult for hiring managers to know the quality of the candidates.

NIST officials said there were a number of factors that likely contributed to the decline in applications. Some of the reasons for fewer applicants include graduates preferring permanent employment versus the temporary employment offered at NIST, more competitive salaries or flexible work schedules offered by private employers, and a greater number of graduates who are interested in careers outside of research. Officials said they planned to expand the recruitment and engagement portfolio to continue to raise awareness about the program to help attract more candidates. Nonetheless, officials said they believe the NRC Postdoctoral Program's applicant pool still provides high quality candidates.¹⁹

Pay and Other Factors Limit NIST's Ability to Compete for a Highly Qualified Workforce

NIST's ability to compete for a highly qualified workforce is limited by various factors, including pay, education requirements, telework and workplace flexibilities, and limited permanent positions.

Pay. NIST's limited ability to pay higher wages presents a recruitment challenge. We previously reported that agencies can experience recruiting challenges due to differences in pay compared to private sector employers. Consistent with federal law, NIST employees may not receive a salary higher than the upper-most limit of their pay band.²⁰ While NIST uses its own personnel system that allows for flexible pay setting within pay bands, it still faces constraints on how much it can compensate employees within a given pay band.²¹ Officials from all six labs said it is difficult to compete with private employers that can offer candidates higher salaries. For example, Information Technology Laboratory hiring

¹⁹According to officials from the National Academies of Sciences, Engineering, and Medicine (NASEM), which organizes the program, overall panel review scores of applicants have remained stable from 2011 to 2022, indicating that the quality of candidates has not been affected.

²⁰5 U.S.C. § 5307, and 5 C.F.R. § 530.203. Certain executive branch employees may be excluded from the aggregate limitation on pay by other laws, but they may be subject to similar aggregate limitation provisions administered by their agencies.

²¹NIST can use its personnel system to hire candidates at higher starting salaries within their band, but cannot offer salaries that exceed the band-level pay cap.

managers said NIST candidates could find other employers offering \$25,000 more in annual salaries with less restrictive pay ceilings. According to hiring managers and leadership officials, pay affects recruitment for both early-career and senior level positions. Officials also said certain fields are even more competitive with respect to potential salaries. For example, Material Measurement Laboratory hiring managers said private companies can offer a salary three times higher than NIST for specialists in artificial intelligence and machine learning. See sidebar for more information on how pay affects retention at NIST.

Limited Ability to Raise Pay Also Affects Retention

The National Institute of Standards and Technology (NIST) has 978 scientific and technical staff who are pay capped, with their salary at the top of their band.

Although NIST offers retention incentives, hiring managers said the process of obtaining approval of retention incentives can be challenging due to budget limitations. Officials had mixed perceptions on the efficacy of incentives, which are not formally tracked. One official said even when NIST offers retention incentives, they are sometimes not large enough to compete with the compensation offered by private employers. The same official said the incentive offer is less about the money offered and more about demonstrating to staff that they are valued. Furthermore, officials said sometimes NIST loses staff during the time it takes to obtain approval to use retention incentives.

Source: GAO analysis of NIST testimonial and personnel data. | GAO-23-105521

Inflexible Basic Education Requirements. In addition, multiple hiring managers said they are hindered by OPM basic education requirements for certain positions that prevent them from hiring candidates who have not yet completed their degrees. Specifically, NIST vacancy announcements require applicants to validate that they meet OPM basic education requirements by the closing date of the announcement. One hiring manager said they would like to make job offers to students in the fall prior to graduation—which usually occurs in spring—but OPM qualification standards for certain occupational series (e.g., professional and scientific) have basic education requirements that NIST requires to be complete at the time of application.²² NIST OHRM officials said Commerce’s hiring policy provides flexibility to allow applicants to meet the OPM basic education requirement after application. However, NIST OHRM officials said NIST requires proof of education at the time of application because of the possibility that candidates may be referred and selected but ultimately do not complete their degree. According to hiring managers, they may miss out on hiring candidates to private sector employers that may offer more flexibility with the education requirement.

Telework and workplace flexibility. Additionally, hiring managers and HR Specialists said that Commerce’s limited telework options will affect the candidate pool who may seek flexible telework policies offered by other employers. NIST hiring managers said they have lost candidates due to the Commerce telework policy, which generally states employees can telework up to 2 days per week. Furthermore, HR Specialists said they received 52 applications for a job position that required working in the office, but when they posted the same position as “location negotiable” they received 204 applications, about 60 of which were certified as eligible applicants. According to NIST officials, in July of 2022,

²²In accordance with OPM standards, NIST allows applicants to substitute education with experience or combine education and experience to qualify for positions.

NIST obtained an approved variance from Commerce that allows supervisors to approve telework up to 8 days per pay period.

Limited ability to offer permanent positions. The use of term positions may further reduce the pool of potential applicants. Some officials said their recruitment efforts were hindered by their limited ability to offer permanent employment rather than term positions. For example, the Communications Technology Laboratory hiring managers said more positions are offered as term rather than permanent positions, which is an impediment because most candidates look for permanent positions. Hiring managers said prospective employees typically prefer permanent positions because of the stability, but NIST faces limitations on the number of permanent positions it can offer due to its budget. However, hiring managers said term employment is a helpful option because it provides necessary skills for a limited duration of time and gives them a chance to evaluate candidates for potential permanent opportunities.

Elements of NIST Culture Can be Unwelcoming to Women and Some Groups Are Underrepresented

NIST's reports and studies of its workforce have shown that employees' perceptions of NIST culture differ by gender, disability, and ethnicity. These reports identified gender-related imbalances in promotion and underrepresentation of people with disabilities and Hispanic or Latino employees.²³ Further, NIST's Strategic Plan notes the agency needs to improve its institutional culture to address a number of issues related to diversity to make it more attractive to incoming generations of new talent and empower a diverse workforce.

NIST reports identified gender-related imbalances in career advancement and leadership roles, as well as an unwelcoming environment for women at NIST. Specifically, the percentage of women compared to men occupying higher levels of management is smaller than the percentage of women compared to men occupying entry-level positions. Additionally, women are promoted to pay Band IV more slowly than men at each level

²³National Institute of Standards and Technology, *Assessing Inclusivity of Women at NIST: A Comprehensive Examination of HR Data, In-Depth Interviews, and Survey Data*, NISTIR 8376 (July 2021); U.S. Equal Employment Opportunity Commission, *Federal Agency Annual EEO Program Status Report, Department of Commerce, National Institute of Standards and Technology* (for period covering October 1, 2019 to September 30, 2020).

of education.²⁴ NIST studies also found that women were more likely to believe they must work harder for recognition, and that they miss out on career advancement opportunities because of their gender.²⁵

In general, NIST officials said staff have expressed frustration with the lack of transparency during the promotion process, and said there are misconceptions about standards for promotion. Furthermore, women were more likely than men to report harassment and microaggressions—a form of regular, frequent harassment typified by comments or actions that subtly and often unconsciously or unintentionally express a prejudiced attitude toward a member of a marginalized group, according to one report.²⁶ Such actions may include subtle putdowns, lack of respect, and questioning competence. The same report stated approximately 26 percent of women reported experiencing harassment, compared to 3 percent of men. Additionally, about half of women reported being interrupted in meetings compared to 5 percent of men, and about 22 percent more women reported having experienced exclusion from meetings, emails, or other work-related activity than their male counterparts. These disparate experiences of NIST’s culture by women may affect retention. For example, more women than men—28.8 percent versus 11.3 percent—report they have considered leaving NIST for reasons related to workplace culture.²⁷

While most NIST studies around diversity focus on gender-related experiences, NIST reports to the Equal Employment Opportunity Commission (EEOC) show that other employee groups are underrepresented at NIST. Specifically, according to a 2020 report to EEOC on barriers to equal employment opportunities, the percentage of people with disabilities in mid- to senior-level positions was 6.59 percent, which fell below NIST’s own goal of 12 percent.²⁸ NIST also reported low

²⁴National Institute of Standards and Technology, *Examining Recent HR Data for Gender Bias Among Federal Employees at NIST*, NISTIR 8363 (March 2021).

²⁵In the fall of 2019, NIST conducted a series of three studies to better understand equity and inclusivity, including one HR demographic workforce data collection and analysis, one qualitative data collection and analysis, and one quantitative collection and analysis. It also produced a final report that integrated the findings of these studies, NISTIR 8376.

²⁶NISTIR 8376.

²⁷NISTIR 8376.

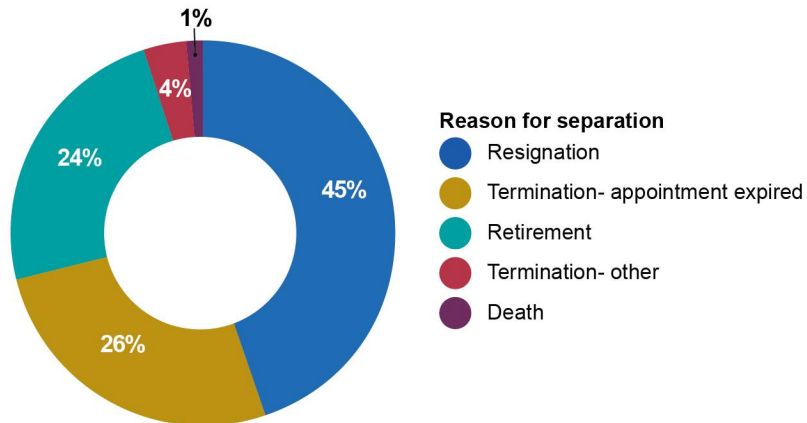
²⁸U.S. Equal Employment Opportunity Commission, *Federal Agency Annual EEO Program Status Report, Department of Commerce, National Institute of Standards and Technology*, (for period covering October 1, 2019 to September 30, 2020).

participation rates of people with disabilities in its leadership training program, and does not have a targeted recruitment approach for people with disabilities, according to the same report. Additionally, NIST found that Hispanic or Latino employees are not represented at the expected participation rate across the agency, which is benchmarked to the Census Bureau's Civilian Labor Force Data that most recently showed Hispanic men at 5.1 percent of the workforce and Hispanic women at 4.79 percent of the workforce. According to NIST demographic data, its Hispanic or Latino workforce was 3.3 percent in FY 2021.

NIST Has a Small and Specialized Talent Pool that Is Difficult to Replace

Departures and retirements threaten NIST's ability to maintain institutional knowledge due to a small number of employees with specialized skills who are difficult to replace as retirements or resignations occur. From 2017 to 2021, 45 percent of departures were due to resignation and 24 percent were due to retirements. Other reasons for departure include the end of a temporary appointment and termination, among others (see fig. 4). Some departing staff lead programs or possess unique knowledge about niche technologies, and hiring managers said even when departures are announced in advance, NIST typically does not have the budget to hire someone until after an employee resigns or retires. Therefore, the departing employee may not have the opportunity to directly transfer knowledge to their replacement.

Figure 4: Percentage of NIST Employee Departures by Reason for Separation, Fiscal Year 2017 through 2021



Source: GAO analysis of National Institute of Standards and Technology (NIST), Office of Human Resources Management data. | GAO-23-105521

Accessible Data for Figure 4: Percentage of NIST Employee Departures by Reason for Separation, Fiscal Year 2017 through 2021

Reasons for Separation	Sum of Count	Percentage
Resignation	366	45.00
Termination - Appt. Expired	214	26.00
Retirement	194	24.00
Termination - Other	29	4.00
Death	11	1.00

NIST is projected to experience high rates of retirement eligibility in the next 5 years and may face challenges replacing retirees, particularly given the limited supply of talent with specialized skills and expertise that NIST relies on. According to NIST data, among its S&T workforce, 28.6 percent of NIST’s workforce is eligible for retirement as of 2021 and 43.5 percent will be eligible for retirement within the next 5 years. Furthermore, resignation is the most common reason for an employee to separate from NIST. The experience and accumulated institutional knowledge concentrated in a few staff members makes it difficult to lose them.

For example, hiring managers said NIST may have only one to two employees with a particular specialized skill set. If one employee retires, it can take around 6 months before a new employee can be hired as a replacement on the project. Material Measurement Laboratory officials said it is difficult to find replacement staff with the same level of expertise as departing staff, and in one case, the lab hired two people to replace one departing employee. It can also take a long time to ensure new employees complete the proper training and certifications. For example, NIST Center for Neutron Research officials said it could take up to 1 year to certify a nuclear operator. As previously discussed, at the Material Measurement Laboratory, NIST must hire chemists and train them for the chemical metrology position because degrees are not available in such a narrow field.

NIST Implements Some Leading Practices, but Lacks a Strategic Workforce Planning Process

NIST has taken actions to help address the recruitment and retention challenges it faces, but it does not fully implement all selected leading practices. We identified human capital management practices from our

prior work and OPM, then selected 10 practices related to the challenges NIST is facing.²⁹ We organized these 10 practices across five areas: 1) recruitment, 2) competition for highly qualified talent, 3) fostering an inclusive culture, 4) maintenance of institutional knowledge, and 5) strategic workforce planning. The five areas correspond to the challenges described above as well as to NIST’s overall workforce planning. Across these five areas, NIST has fully implemented two and partially implemented seven leading practices. However, NIST has not implemented the leading practice to establish and maintain a strategic workforce planning process, which could help the agency address long-term human capital challenges (see table 1).

Table 1: NIST Implementation of Selected Leading Practices for Human Capital Management

Workforce Area	Selected Leading Practice	NIST Implementation of Leading Practices
Recruiting a Specialized Workforce	Develop an agency brand or branding strategies to build credibility with employees and potential applicants.	partially implemented
Recruiting a Specialized Workforce	Cultivate a diverse talent pipeline by building relationships and developing strategic partnerships with a range of institutions and organizations.	partially implemented
Competing for a Highly Qualified Workforce	Strategically leverage available payment authorities and hiring flexibilities.	partially implemented
Competing for a Highly Qualified Workforce	Provide employees with career development and training.	fully implemented
Fostering an Inclusive Culture	Hold management accountable for the progress of diversity initiatives.	fully implemented
Fostering an Inclusive Culture	Use quantitative and qualitative measures to evaluate the effectiveness of the organization’s diversity management efforts and the progress it is making in those efforts.	partially implemented
Maintaining Institutional Knowledge	Maintain an ongoing succession planning process for identifying and developing a diverse pool of talent for an organization’s potential future leaders.	partially implemented

²⁹Leading practices in human capital management were selected from GAO, *Federal Workforce: Key Talent Management Strategies for Agencies to Better Meet Their Missions*, [GAO-19-181](#) (Washington, D.C.: Mar. 28, 2019); U.S. Secret Service: *Action Needed to Address Gaps in IT Workforce Planning and Management Practices*, [GAO-19-60](#) (Washington, D.C.: Nov. 15, 2018); *Federal Workforce: Additional Analysis and Sharing of Promising Practices Could Improve Employee Engagement and Performance*, [GAO-15-585](#) (Washington, D.C.: July 14, 2015); *Diversity Management: Expert-Identified Leading Practices and Agency Examples*, [GAO-05-90](#) (Washington, D.C.: Jan. 14, 2005); *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington, D.C.: Mar. 1, 2004); and Office of Personnel Management, *End to End Hiring Initiative* (Washington, DC: March 2017).

Workforce Area	Selected Leading Practice	NIST Implementation of Leading Practices
Maintaining Institutional Knowledge	Link succession planning and training efforts, such as for leadership development programs that are targeted to help address specific challenges related to diversity, leadership capacity, and retention.	partially implemented
Workforce Planning	Develop strategies and plans to address gaps in competencies and staffing.	partially implemented
Workforce Planning	Establish and maintain a strategic workforce planning process.	not implemented

Legend: ○=not implemented ◐=partially implemented, ●=fully implemented

Source: GAO analysis of National Institute of Standards and Technology (NIST) human capital management practices. | GAO-23-105521.

Note: We evaluated the extent to which NIST actions implemented, partially implemented, or did not implement each leading practice based on evidence NIST provided. 'Fully Implemented' means NIST provided evidence that it has fully implemented a leading practice. 'Partially implemented' means NIST provided evidence that it has taken some steps toward implementing a leading practice. 'Not implemented' means NIST provided evidence that its actions do not align with a leading practice.

Strategic workforce planning aligns an organization's human capital program with its current and emerging mission and programmatic goals, and develops long-term strategies for acquiring, developing, and retaining staff to achieve those goals. This process—in conjunction with identifying skills and competencies and analyzing gaps—enables an organization to be agile, resilient, and responsive to current and future demographic and technological trends, as well as other demands. Our prior work has found that a strategic workforce planning process is particularly important for agencies with science and technology missions such as NIST, which must compete for talent with the private sector and universities, and keep pace with scientific advancements.³⁰

NIST Is Developing Branding and Recruiting Strategies and Plans Further Efforts.

To address challenges with recruiting a specialized pool of candidates, NIST partially implemented leading practices we identified for developing an agency brand and developing strategic partnerships, and plans further efforts to implement leading practices.

Develop an agency brand. NIST partially implemented the leading practice to develop an agency brand or branding strategies to build credibility with its employees and potential applicants. Specifically, NIST is developing its agency brand to build familiarity with the agency and

³⁰GAO, *FDA Workforce: Agency-Wide Workforce Planning Needed to Ensure Medical Product Staff Meet Current and Future Needs*, [GAO-22-104791](#) (Washington, D.C.: Jan. 14, 2022).

strengthen NIST's reputation as a potential employer among candidates, but has not fully aligned its recruiting and branding strategies to prepare its recruiters as brand ambassadors. NIST is drafting a strategic recruitment plan and plans to develop training and resources that, if implemented, will address this practice.

In its Strategic Plan, NIST noted it has a strong reputation for technical excellence but does not have a strong brand by which it is readily identified. In response, NIST established an objective to strategically communicate its priorities, capabilities, and value through enhanced branding and internal and external communications. Additionally, NIST's Strategic Recruitment Program Manager said he has begun conducting outreach through recruiting events to increase its brand recognition among potential candidates.

NIST officials said they use different approaches to promote NIST and communicate the value of its work, which aids recruiting and retention efforts:

- Officials promote NIST's mission and work through attendance and participation in conferences and meetings of professional associations, which increases awareness of NIST in specialized fields.
- NIST established student programs, which can help identify potential candidates for employment at the agency. These programs include the Summer Undergraduate Research Fellowship, which offers opportunities for undergraduate students to engage in research at NIST facilities. Another student program, the Professional Research Experience Program, provides laboratory experience and financial assistance to undergraduate, graduate, and post-graduate students. Such programs can raise awareness of NIST's work.
- Officials in some labs said they promote autonomy and academic freedom at NIST. One official said this helps attract candidates who desire a scientific career in which they can focus on their research rather than generate revenue, as may be expected in the private sector. The flexibility and nature of the work also makes staff want to stay, according to officials.

However, while hiring managers may be able to promote NIST's mission and work when recruiting, some do not have information on other benefits including health benefits, insurance options, and vacation or sick leave. OHRM officials said OHRM and hiring managers collaborate on hiring, and human resource managers said they are drafting a strategic

recruitment plan and will develop a training component and resources for hiring managers to understand their role as brand ambassadors and how to promote NIST. OHRM HR Specialists said there are resources and materials hiring managers can use when recruiting, such as brochures and flyers that contain information about benefits.

Build relationships and develop strategic partnerships. NIST partially implemented the leading practice to cultivate a diverse talent pipeline by building relationships and developing strategic partnerships with a range of institutions and organizations. Specifically, NIST sources talent through multiple channels, such as through outreach to institutions and attendance at career fairs and conferences. However, it currently uses a limited number of recruiting partnerships, programs, and networks. NIST is planning further efforts to strengthen recruiting partnerships with institutions and organizations that, if implemented, would fully address this practice.

NIST has taken actions to recruit a specialized workforce using various approaches to reach candidates. Hiring managers said they recruit through university career fairs and events organized by professional associations, such as meetings and conferences. Officials from NIST's International and Academic Affairs Office also attend recruiting events and promote NIST's education programs, including the NRC Postdoctoral Program. While they have established relationships with some institutions, officials said they have not formally assessed the effectiveness of their recruiting efforts.

Some of NIST's recruiting efforts target members of underserved communities.³¹ According to officials in some operating units, NIST conducts targeted outreach to institutions such as Historically Black Colleges and Universities and other organizations, career fairs, and professional conferences that serve underserved communities. Officials said NIST also provides funding for labs to recruit students from underserved communities into NIST's education programs. For example, officials from one lab said the lab funded four NRC postdocs in the last

³¹The term "underserved communities" refers to populations sharing a particular characteristic, as well as geographic communities, who have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. Exec. Order No. 14035, § 2(a), 86 Fed. Reg. 34,593 (June 30, 2021).

year who either belong to or work with a research advisor from an underserved community.

However, according to NIST's Diversity, Equity, Inclusion, and Accessibility (DEIA) Strategic Plan, the agency currently uses a limited number of partnerships, programs, and networks to attract candidates from underserved communities.³² While one lab established some innovative partnerships with academic institutions to help address specialized workforce needs (see textbox), officials from other NIST labs described recruitment efforts as limited to advertising opportunities on job boards and spreading word through professional contacts. Officials from all NIST labs said they use their own personal and professional networks to recruit candidates for available positions, but this approach draws from limited pools of candidates and may not reach high quality candidates outside of these personal and professional networks. NIST OHRM officials said hiring managers have not pursued new and broader sets of recruiting sources because they rely on recruiting sources familiar to them and those that have worked in the past, but may not have drawn from diverse pools of candidates.

According to officials, NIST does not consistently measure the effectiveness of its recruiting strategies. This can limit its understanding of the effectiveness of existing partnerships, and whether changes are needed to identify and develop successful partnerships that yield the diverse and skilled candidates NIST seeks. NIST's DEIA Strategic Plan includes a strategy to cultivate strategic partnerships with minority-serving institutions supported by action items to conduct and track targeted recruitment and outreach activities to minority-serving and other institutions and programs. According to the plan, NIST will leverage its strategies and action items over the next 2 years.

³²National Institute of Standards and Technology, *Diversity, Equity, Inclusion, and Accessibility Strategic Plan, FY22-FY24*. NIST's DEIA Strategic Plan adopts DEIA definitions from Sec. 2(b), 2(c), 2(d), and 2(e) of Executive Order 14035 on "Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce," which defines diversity as the practice of including the many communities, identities, races, ethnicities, backgrounds, abilities, cultures, and beliefs of the American people, including underserved communities.

Institutional Partnerships Used by NIST’s Material Measurement Laboratory

In 2018, NIST’s Material Measurement Laboratory (MML) partnered with Georgetown University and the US Environmental Protection Agency to launch an Environmental Metrology and Policy Program. The program provides education and training in environmental metrology, which helps address the challenge of finding candidates in this specialized field. One official in MML said the Chemical Sciences division brings students from the program to NIST to conduct research, and the division has identified potential employment candidates through the program.

MML also recruits through the Milligan Graduate Fellowship at the University of Maryland, which promotes diversity through fellowship awards to underrepresented students in the fields of Chemistry and Biochemistry. MML officials said the program has been successful for allowing NIST to identify promising candidates to hire after they graduate.

Source: GAO analysis of information from National Institute of Standards and Technology (NIST) and university websites. | GAO-23-105521

Officials said NIST traditionally recruits from educational institutions when an event takes place or there is a specific job opening, rather than continuously throughout the year. However, according to OPM, agencies should cultivate relationships with these institutions on an ongoing basis.³³ Officials said NIST hired a strategic recruitment program manager in February 2022 to strengthen recruiting relationships and implement a continuous, year-round recruiting strategy. They said the new hire will help NIST develop a more comprehensive strategy for addressing workforce needs. As of October 2022, officials said the program consisted of only one full-time employee, but OHRM has requested and received funding for two new positions to support the strategic recruitment function to be filled in calendar year 2023. OHRM officials also said they plan to develop and implement an agency-wide strategic recruiting plan and training materials for hiring managers in FY 2023.

NIST Inconsistently Uses Pay and Hiring Flexibilities, but Fares Better in Providing Career Development Opportunities

To address challenges competing for a highly qualified workforce, NIST partially implements leading practices we identified to strategically leverage available flexibilities and fully implemented the leading practice to provide career development opportunities, as discussed below.

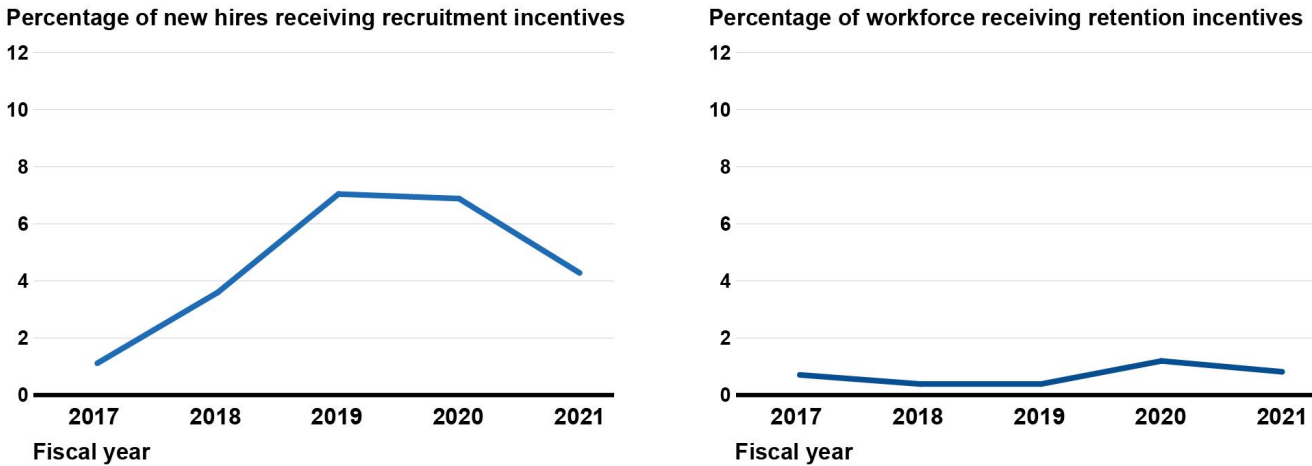
Strategically leverage payment authorities and hiring flexibilities. NIST partially implemented the leading practice to strategically leverage

³³Office of Personnel Management, *End to End Hiring Initiative* (Washington, DC: March 2017).

available flexibilities to recruit and retain employees. Specifically, NIST uses its authority to pay recruitment and retention incentives, but does not consistently do so, and does not measure the effectiveness of using these incentives. Further, NIST has not fully leveraged available hiring flexibilities, such as hiring current students through its Pathways Program, but plans additional training to educate hiring managers on hiring options including the Pathways program.

While limited in its ability to offer higher salaries, from 2017-2021, NIST has occasionally used payment authorities such as recruitment incentives (a total of 38 times out of 829 new hires), and retention incentives (a total of 64 times), (see fig. 5).³⁴ Additionally, five out of six labs have used student loan repayments from 2017-2021, a total of 31 times.

Figure 5: Recruitment Incentives as a Percentage of Hires, and Retention Incentives as a Percentage of NIST’s Workforce



Source: GAO analysis of National Institute of Standards and Technology (NIST) data. | GAO-23-105521

³⁴According to NIST documentation, heads of operating units are authorized to pay a recruitment incentive up to \$10,000 for individual employees. With additional approval, recruitment incentives may be authorized up to 50% of the annual rate of basic pay based on a critical need. Individual retention incentives may be authorized up to 25 percent of basic pay when, in the absence of the incentive, it would be difficult to fill a position with a highly-qualified employee.

According to data NIST provided, some of NIST’s hiring actions were subject to a hiring freeze in fiscal years 2017 and 2018 and to a hiring furlough in 2019.

Accessible Data for Figure 5: Recruitment Incentives as a Percentage of Hires, and Retention Incentives as a Percentage of NIST's Workforce

Fiscal year	Percentage of new hires receiving recruitment incentives
2017	1.12%
2018	3.61%
2019	7.06%
2020	6.90%
2021	4.29%

Fiscal year	Percentage of workforce receiving retention incentives
2017	0.71%
2018	0.39%
2019	0.39%
2020	1.20%
2021	0.82%

Note: From 2017 to 2021, NIST paid recruitment incentives to 4.6 percent of new hires in science and technical fields and paid retention incentives to less than 1 percent of its science and technical workforce.

However, hiring managers and HR officials told us the agency does not consistently use available payment authorities. Some hiring managers said the process was straightforward, while others said their understanding of requirements and justification for using recruitment and retention incentives varied depending on the HR Specialists and lab officials involved in the decision. HR Specialists we spoke to said NIST would benefit from having more options for retaining staff, because the ability to offer retention incentives and telework is limited for some technical staff based on the nature of work. According to HR Specialists, sometimes the only available option is to offer student loan payments. In addition, an official in the Material Measurement lab said the lab can sometimes substitute for these incentives by offering to purchase lab equipment or hire additional staff.

Additionally, according to NIST officials, NIST does not evaluate the effectiveness of using recruitment and retention incentives. We have previously reported on the importance of measuring human capital strategies, such as hiring and retention strategies, to evaluate how they

contribute to goals and allow for any needed updates to the strategies.³⁵ NIST collects data on how often the incentives have been used or paid. However, NIST OHRM does not track how often incentives have been offered, according to officials. They said the NIST Personnel Management Board annually reviews retention incentives to determine if they are still warranted, but NIST does not track the effectiveness of the recruitment or retention incentives. Without an understanding of whether the incentives are effective in attracting or retaining employees, NIST may not be applying these incentives effectively.

As we previously reported, collecting and using data to assess the effectiveness of authorities would be a critical first step in making more strategic use of flexibilities to effectively meet hiring needs.³⁶ We also reported examples from agencies that were able to identify specific payment authorities that worked for recruiting and retaining individuals from specific career fields.³⁷ Officials in different operating units provided wide-ranging estimates of how well incentives worked based on personal experience. Some officials said the incentives were successful in retaining staff about half the time, while others said the incentives worked nearly all the time. Without tracking the success of incentives, NIST is unable to leverage options strategically to make the most effective use of flexibilities in attracting and retaining staff.

³⁵GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, [GAO-04-39](#) (Washington, D.C.: Dec. 11, 2003).

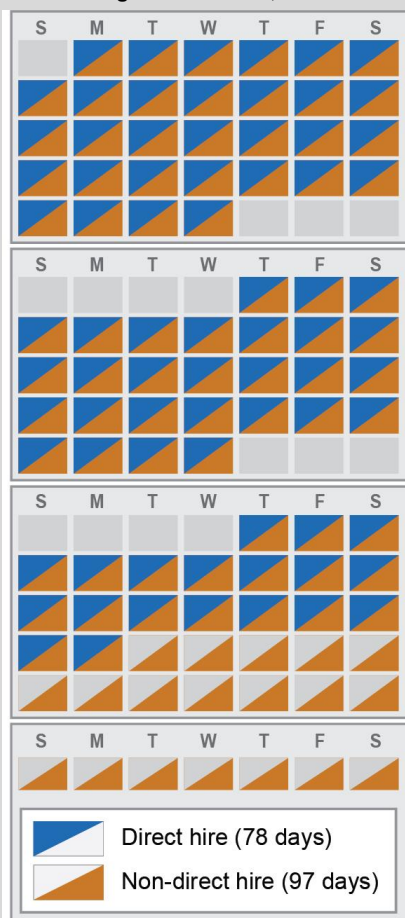
³⁶GAO, *Cybersecurity: Federal Efforts Are Under Way That May Address Workforce Challenges*, [GAO-17-533T](#) (Washington, D.C.: Apr. 4, 2017).

³⁷GAO, *Federal Pay: Opportunities Exist to Enhance Strategic Use of Special Payments*, [GAO-18-91](#) (Washington, D.C.: Dec. 7, 2017).

NIST's Use of Direct Hiring Authority to Reduce Time-to-Hire

To speed the hiring process, National Institute of Standards and Technology (NIST) uses direct hiring authority. NIST is authorized to use this authority for all scientific and engineering positions at Pay Band III and above. In fiscal years 2020 and 2021, the agency used direct hiring authority for 49 percent of all hires, which reduced hiring time by 19 days on average (see figure). NIST time-to-hire data spans the time from a request to fill a vacancy to the job offer.

NIST Average Time to Hire, FY 2020-2021



Similarly, NIST has not consistently used hiring flexibilities available to the agency. NIST HR officials and hiring managers said hiring managers are sometimes not aware of all available hiring flexibilities, and they sometimes rely on the past experience of others as a model for new positions. As a result, hiring managers may not be taking advantage of the full suite of options to meet their hiring needs. For example, some NIST hiring managers said they cannot hire promising students prior to graduation, but HR officials told us the Pathways Program is an under-used hiring avenue that allows NIST hiring managers to recruit students

still in school. These students can then be converted as employees under non-competitive hiring authority upon graduation.³⁸

Some hiring managers said it would be helpful to have greater awareness about the use of incentives, and OHRM officials told us they are developing a strategic recruiting plan that will include a goal to improve awareness about authorities and flexibilities. To accompany the plan, OHRM officials said they will develop training for hiring managers in FY 2023 on hiring options and they plan to educate them on recruiting for the Pathways Program, which will address hiring managers' lack of understanding about the full slate of tools available when hiring. Previous GAO work reported that federal agencies rely on a small number of authorities either because they are unfamiliar with other authorities or because they have found other authorities to be less effective.³⁹

Provide career development opportunities. NIST fully implemented the leading practice to provide career development opportunities to aid in the recruitment and retention of staff. Specifically, NIST offers training, mentoring, and other opportunities for staff to develop skills. The variety of career development opportunities NIST offers may help attract staff interested in developing professionally and may increase employee engagement, both of which support retention of qualified staff.

To compete for and retain qualified staff, NIST offers a range of career development opportunities. NIST provides formal and on-the-job training to develop specialized skills after onboarding new staff. For example, NIST offers trainings to develop writing and other skills, and some lab officials said they provide technical training in other skills areas, such as data science, led either by staff experts or outside trainers. NIST further develops staff through four leadership programs:

- The Foundations of Leadership Development Program equips potential leaders with foundational competencies and skills.

³⁸The Pathways Programs (Internship Program, Recent Graduates Program, and Presidential Management Fellows Program) are streamlined developmental programs tailored to promote employment opportunities for students and recent graduates in the federal workforce.

³⁹GAO, *Federal Hiring: OPM Needs to Improve Management and Oversight of Hiring Authorities*, [GAO-16-521](#) (Washington, D.C.: Aug. 2, 2016).

- The New Leader Program is designed to provide new leaders with the necessary knowledge and skills to be successful in leadership positions at NIST.
- The Project Management and Leadership Program develops skills tailored to meet the specific needs of NIST project managers.
- The Leadership for All initiative makes content from leadership programs available to all staff.

According to a NIST-contracted study, NIST staff rate leadership trainings positively, but officials from some labs said due to limited available spots, they are not able to accommodate as many staff as are interested in participating. The same study compiled a list of additional development opportunities staff said they would like NIST to offer—for example, coursework related to project-specific and other professional skills—and recommended NIST fulfill staff requests for training related to career growth by offering more classes. HR officials, in turn, provided documentation of training and development opportunities and said they offer a comprehensive leadership and employee development curriculum that includes coursework, numerous assessments, and coaching opportunities. NIST also maintains a formal mentoring program, and officials from some labs said they offer detail and rotational opportunities in which staff can gain experiences outside of their primary operating units. HR officials said the mentoring program is a recruiting tool, particularly for postdocs looking for an advisor or mentor to further their professional development.

We have previously reported that career development and training is one of the strongest drivers of employee engagement.⁴⁰ Specifically, we found the Federal Employee Viewpoint Survey item, “I am given a real opportunity to improve my skills in my organization” to relate positively with higher engagement scores government-wide. Accordingly, in 2020, 84.7 percent of NIST employees provided positive responses to this item (14.8 percentage points higher than the government-wide average), and NIST’s employee engagement index scores are higher than those of similarly sized agencies on average.⁴¹ Officials in one lab said the

⁴⁰[GAO-15-585](#).

⁴¹OPM’s Employee Engagement Index (EEI), calculated from Federal Employee Viewpoint Survey results, concentrates on factors that lead to an engaged workforce such as supporting employee development. NIST’s 2020 EEI score was 80 while the benchmark score for medium-sized agencies was 75. The two other medium-sized bureaus within Commerce—Census Bureau and International Trade Administration—had 2020 scores of 76 and 74, respectively.

environment at NIST, and opportunities available to work on interesting projects and with external professional associations, contribute to employee satisfaction and retention.

NIST Holds Senior Officials Accountable and Is Developing Outcome Measures to Evaluate Effectiveness of Diversity Efforts.

To address challenges to fostering an inclusive culture, NIST fully implemented the leading practice to hold management accountable for the progress of diversity initiatives. NIST partially implemented the leading practice to use quantitative and qualitative measures to evaluate the effectiveness of its diversity management efforts and the progress it is making toward goals and objectives, as described below.

Hold management accountable for progress. NIST fully implemented the leading practice to hold management accountable for diversity initiatives. Specifically, NIST established performance standards for managers to demonstrate commitment to diversity and inclusion and has created an office and strategic plan to further the agency's efforts. According to the leading practice, holding managers accountable for progress in meeting diversity objectives is a key element for ensuring the success of diversity management efforts.⁴²

NIST holds managers accountable for diversity and equity performance standards. All NIST supervisors are required to demonstrate commitment to valuing diversity in all aspects of program and human resources decisions. For example, supervisors may provide evidence of requiring a respectful work environment or encouraging staff to participate in outreach activities to underserved institutions. Further, Senior Executive Service officials should meet a performance requirement of fostering a culture of inclusion and engagement by employing culture change strategies. Such strategies can include implementing relevant training and education; new initiatives or review of policies, programs, systems or techniques currently in use; or other appropriate activities that demonstrate progress in meeting inclusion objectives.

NIST established a Diversity, Equity, and Inclusivity Office (DEIO), which focuses on workplace culture and supplements the efforts of the

⁴²[GAO-05-90](#).

compliance-focused Equal Employment Opportunity and Accessibility Office. As of February 2023, the DEIO included four detailees and an Acting Director, according to DEIO officials. Officials said the DEIA office will provide central support to coordinate the agency’s efforts including those of over 30 groups within NIST. Such groups include voluntary networks of employees united by shared common experiences or goals that offer members opportunities to organize discussions and raise awareness of issues relevant to membership.

NIST also published a DEIA Strategic Plan in July 2022 that established agency-wide DEIA goals and identified objectives, strategies, and actions to support each goal (see fig. 6).⁴³ For example, one NIST strategy to support the goal of cultivating an equitable culture is to assess and/or address barriers to advancement to increase the representation of underserved communities and ensure an equitable work environment and experience for employees.

Figure 6: Examples of National Institute of Standards and Technology (NIST) Diversity, Equity, Inclusion, and Accessibility (DEIA) Strategic Goals and Strategies



Source: National Institute of Standards and Technology (NIST) Diversity, Equity, Inclusion, and Accessibility Strategic Plan, fiscal year (FY) 2022-2024. | GAO-23-105521

Evaluate the effectiveness of diversity efforts. NIST partially implemented the leading practice to use quantitative and qualitative

⁴³National Institute of Standards and Technology, *Diversity, Equity, Inclusion, and Accessibility Strategic Plan, FY22-FY24*.

measures to evaluate the effectiveness of diversity management efforts and progress toward goals and objectives. Specifically, NIST does not currently measure the effectiveness of some DEIA goals and initiatives, but it established teams to define outcome measures for goals and action items in its DEIA Strategic Plan. Officials said NIST plans to implement outcome measures beginning in FY 2023, which, if implemented, would address this leading practice.

Officials told us NIST did not have formal agency-wide DEIA goals prior to the publication of its DEIA Strategic Plan in July 2022, and NIST needs to develop better capabilities to measure the effectiveness of its diversity initiatives. According to officials, NIST currently only measures outputs instead of outcomes for some initiatives, such as levels of participation and program registration. NIST does not measure the effectiveness of diversity recruiting strategies. According to OMB, output measures track program activities, but outcome measures are needed to track the progress a program is making toward its goals.⁴⁴ Until NIST develops outcome measures to evaluate diversity management outcomes, NIST will not be able to assess whether its DEIA initiatives are succeeding in meeting its strategic objective of fostering a more inclusive environment.

NIST's DEIA Strategic Plan includes action items to further establish accountability mechanisms to advance DEIA goals. One of these action items is to confirm quarterly progress indicators and annual outcome metrics to measure progress against DEIA goals. NIST's DEIA Strategic Plan also includes an action item to measure targeted outreach activities to recruit from underserved communities. Officials from the DEIA office said deployment teams will develop measures for goals during the plan's implementation phase, beginning at the start of FY 2023.

Prior to developing its DEIA Strategic Plan, NIST conducted qualitative and quantitative studies to understand disparities and employees' experiences. In 2018, NIST established the Steering Group for Equity in Career Advancement, which sponsored DEIA-related studies. These studies included an assessment on inclusivity of women at NIST and an examination of HR data for evidence of gender bias, and guidance for labs on equitable hiring practices. NIST used these sources and others to identify short- and long-term goals included in its DEIA Strategic Plan.

⁴⁴Office of Management and Budget, Circular No. A-11, *Preparation, Submission, and Execution of the Budget*, pt. 7, app. 13, at 90 (Aug. 2022).

NIST Has Taken Steps to Plan for Vacancies and Leadership Needs, but Does Not Conduct Agency-wide Succession Planning

To address challenges maintaining institutional knowledge, NIST partially implemented leading practices for maintaining an ongoing succession planning process and linking succession planning and training efforts, as discussed below.

Maintain an ongoing succession planning process. NIST partially implemented the leading practice to maintain an ongoing succession planning process for identifying and developing a diverse pool of talent for its potential future leaders. Specifically, NIST has established staff who can perform certain roles in place of other staff and prepares staff for leadership roles, but NIST does not conduct succession planning agency-wide. Further, lab officials said their approaches to succession planning are informal, such as tracking potential retirements and mentoring staff.

NIST takes steps to prepare for sudden personnel changes.⁴⁵ For example, officials in one lab said they identify staff members who can take over for primary staff members to provide certain measurement services for industry and other customers. NIST also offers a phased retirement program that allows retiring staff to work part-time and train their replacements, according to officials. However, this approach cannot be relied upon because the retiring employee may choose not to participate in the program, and not all vacancies can be anticipated. We have previously reported that leading organizations go beyond a “replacement” approach that focuses on identifying particular individuals as possible successors for specific positions, and engage in broad integrated succession planning and management efforts that focus on strengthening both current and future capacity.⁴⁶

NIST also prepares staff for leadership succession. As mentioned above, NIST operates leadership and mentoring programs and provides opportunities for details, rotations, and other trainings. According to officials, NIST developed a set of core leadership competencies, and the

⁴⁵GAO's *Standards for Internal Control in the Federal Government* distinguishes contingency planning (for responding to sudden personnel changes that could compromise the internal control system) from succession planning (for replacing personnel over the long-term). [GAO-14-704G](#) (Washington, D.C.: Sept 2014).

⁴⁶[GAO-05-90](#).

agency tailors training and development opportunities to early career and senior staff. For example, NIST uses rotational assignments within the Department of Commerce for its Senior Executive Service officials. Additionally, some organizational units have sent staff to external leadership development programs.

NIST does not conduct an agency-wide succession planning process. Officials said NIST's leadership competencies provide a framework for evaluating, tracking, and addressing leadership skill needs and developing staff. However, while NIST's leadership programs and competency model may be elements of a succession planning framework that help address the need to develop a corps of leaders and managers, NIST does not currently assess its workforce to identify technical and leadership needs and potential succession gaps, or implement NIST-wide strategies to address any gaps. According to OPM guidance, succession planning for technical and leadership roles involves identifying current and projected workforce needs based on strategic goals, analyzing the talent pool to identify succession gaps, and developing succession management strategies to address gaps.⁴⁷ Additionally, the guidance states that agencies should analyze current recruitment, selection, development, and retention programs and practices to assess how well they can meet or support projected succession needs and targets. However, as we mentioned previously, NIST officials told us they do not evaluate the success of some aspects of recruitment and retention strategies.

Without a NIST-wide approach, officials said labs address their own succession needs. However, officials from all six labs told us they also do not use formal or written processes or plans for succession. For example, officials in one lab said their lab keeps track of potential retirements to anticipate future needs, but the lab's limited budget prevents them from planning and funding succession in many critical areas. Officials in this lab and one other lab said they use informal mentoring to help plan for succession of key staff.

OHRM officials said they would like to implement Commerce's succession planning framework, which guides planning, execution, and evaluation of succession planning and management activities, but they

⁴⁷Office of Personnel Management, *A Guide to Strategic Leadership Succession Management*, (March 2009).

lack staff resources to do so.⁴⁸ These officials said they requested funds in the FY 2023 budget request to add a staff member who can coordinate with the Commerce succession program manager to learn leading practices and implement the succession planning framework at NIST.

Without implementing a succession planning framework, NIST may have trouble finding staff to perform key program roles. For example, one hiring manager said training in measurement sciences is lengthy, and it is difficult to find experienced staff outside of NIST. Leaders in another lab said they have turned down research opportunities because they did not have the staff needed to perform the research.

Link succession planning and training efforts. NIST partially implemented the leading practice to link succession planning and training efforts, such as for leadership development programs. Specifically, NIST offers training and development opportunities that help prepare future leaders, but has not demonstrated that its development efforts are linked to a succession planning framework.

NIST offers a variety of training and development opportunities, mentioned above, and its leadership competencies model provides criteria for assessing leadership readiness. However, lab officials did not demonstrate that they link succession planning with a clearly defined leadership development strategy. According to the Commerce succession planning and management program maturity model, organizations with leading succession planning programs are able to consistently use workforce supply and demand data to proactively inform talent programs and services, such as developmental opportunities. Lab officials, on the other hand, described using approaches to inform leadership development decisions that were not data-driven.

- According to officials in one lab, division management teams discuss areas of need and the staff members they would like to have take part in NIST leadership training and development programs. Group leaders are encouraged to identify people who can replace them, and division managers think ahead about upcoming retirements and how to replace those staff.
- An official in another lab said staff make it clear to their supervisors if they are interested in leadership positions, and supervisors will try

⁴⁸Department of Commerce, *Succession Planning and Management Guide*, (April 11, 2022).

their best to develop them. Methods to develop staff for leadership positions vary from supervisor to supervisor, according to the official.

Several studies have noted that additional succession planning steps may be necessary to ensure NIST is maintaining and developing knowledge for program continuity and future leadership needs. Two National Academies of Sciences, Engineering, and Medicine assessments of NIST labs in 2021 identified succession planning as an ongoing issue that may need to be addressed to ensure maintenance of competence in core areas while meeting the demand for new areas of competency.⁴⁹ Additionally, a NIST-contracted study recommended that NIST implement a succession planning process for critical management levels. According to NIST's Strategic Plan, its efforts to address challenges in finding, hiring, and retaining talented personnel in a competitive environment have been incomplete and insufficient for creating a corps of leaders and managers. Relatedly, our prior work identified succession examples from other countries and reported that succession planning and management may provide incentive for high-potential employees to stay with an organization, and thus preserve future leadership capacity.⁵⁰

NIST has taken steps to develop a succession planning framework, and has requested funds for staff in FY23 that HR officials said will allow them to implement Commerce's succession planning framework. Without additional staff, NIST may need to adjust priorities to focus on succession planning. Without identifying succession targets and assessing how well development programs and other human capital activities provide support for meeting succession targets and leadership needs, NIST may be unable to effectively assess how well it is preparing an internal talent pool to fill key roles and leadership positions.

⁴⁹National Academies of Sciences, Engineering, and Medicine, *An Assessment of Selected Programs at the National Institute of Standards and Technology Engineering Laboratory: Fiscal Year 2020* (Washington, D.C.: The National Academies Press, 2021). <https://doi.org/10.17226/26051>.

National Academies of Sciences, Engineering, and Medicine, *An Assessment of Selected Divisions of the Information Technology Laboratory at the National Institute of Standards and Technology: Fiscal Year 2021* (Washington, D.C.: The National Academies Press, 2021). <https://doi.org/10.17226/26354>.

⁵⁰GAO, *Human Capital: Insights for U.S. Agencies from Other Countries' Succession Planning and Management Initiatives*, [GAO-03-914](#) (Washington, D.C.: Sept. 15, 2003).

NIST's Workforce Planning Efforts Are Not Consistently Tied to Future Needs or Coordinated with Other Efforts.

To plan for workforce needs, NIST partially implemented the leading practice for developing strategies and plans to address gaps in competencies and staffing, but has not implemented the leading practice on strategic workforce planning, as discussed below.

Develop strategies and plans to address gaps. NIST partially implemented the leading practice to develop strategies and plans to address gaps in competencies and staffing. Specifically, NIST does not assess gaps in scientific and technical skills agency-wide. While NIST labs use various approaches to assess skills gaps, officials from three labs said they do not plan strategies for addressing skills gaps.

We previously reported that agencies should be aware of existing skills and competencies in the workforce to help inform workforce planning,⁵¹ and that they should regularly assess competency and staffing needs.⁵² Officials said NIST identifies and assesses staff skills through several mechanisms, including surveys, training evaluations, focus groups, and regular discussions with NIST staff and leaders. Officials said they have consistently identified leadership skills as a needs area that is critical to staff development and NIST's mission success. However, officials said NIST does not assess scientific and technical skills gaps agency-wide because labs' needs vary and so labs assess their own workforce needs.

NIST OHRM does not conduct analyses of workforce needs with labs, according to officials, and labs use different approaches to assess their own needs. Officials from five labs said they do not use formal or lab-wide approaches to assess skills gaps, and in four of these labs, officials said they assess skills within divisions or groups. Lab officials said they use various approaches to assess skills, such as by considering lab priorities or through informal discussions with staff. Officials in one lab said they become aware of skills gaps through work they are asked to perform and the emergence of new technologies. Additionally, labs' assessments are not conducted on an ongoing basis. Instead, according to lab officials,

⁵¹GAO, *Human Capital: Strategies to Help Agencies Meet Their Missions in an Era of Highly Constrained Resources*, [GAO-14-168](#) (Washington, D.C.: May 7, 2014).

⁵²[GAO-19-60](#).

they may take place when labs learn of pending retirements, or when group and division leaders identify skills they need for upcoming projects.

Absent a NIST-wide process for analyzing staff skills, officials from three labs said they do not develop plans for addressing skills gaps. Labs use strategies to address gaps by hiring staff with the requisite skills and by training existing staff in new skills. However, according to OPM, agencies should analyze current workforce data and future workforce needs, and develop strategies and plans to close competency gaps.⁵³ Without these analyses, some NIST labs' current processes may lead the agency to miss critical skills gaps or information that could inform strategic hiring decisions, such as when to prioritize skills acquisition through permanent hiring instead of contract hiring.

Conduct strategic workforce planning. NIST has not implemented the leading practice to establish and maintain a strategic workforce planning process. Specifically, NIST lacks an agency-wide workforce planning process, sometimes focuses hiring efforts on near-term needs, and does not fully integrate its human capital function into labs' workforce planning.

NIST does not have an agency-wide strategic workforce planning process, although some labs have processes in place to link hiring needs to research priorities. Further, lab officials told us none of the six labs develop their own strategic workforce plans, which could help with identifying gaps in needed skills and strategies to address those gaps. In prior work, we reported that strategic workforce planning includes a process to (1) develop hiring, training, staff development, and succession planning strategies, among others; and (2) consider how strategies can be aligned to address current and future skills and competencies needed for mission success.⁵⁴

While NIST has implemented strategies in some of these areas, the agency has not aligned its strategies to address current and future workforce needs. NIST has implemented training and staff development strategies, and is in the process of developing recruitment strategies, but the agency has not implemented a coordinated process to develop and implement recruiting, succession, or human capital plans linked to workforce planning efforts and aligned with strategic goals. Instead, officials in some labs—the Information Technology lab, Material

⁵³OPM, *End to End Hiring Initiative*.

⁵⁴[GAO-04-39](#).

Measurement lab, and Physical Measurement lab—said they identify focus or priority research areas. Officials said these are topic areas in which they have identified opportunities for technical work and research and then identified hiring needs in those areas. Officials in the Engineering lab said they develop a strategic research plan to guide this process, and hold annual programming meetings, which drive hiring efforts for the year in each of the lab’s divisions.

While the efforts of individual labs help develop the workforce in selected focus areas, they do not contain the kind of long-term, coordinated goals and strategies for the workforce—aligned with agency-wide mission and program goals—that would be part of an agency-wide strategic workforce plan.

Without coordinated, long-term strategies, labs sometimes prioritize near-term needs. For example:

- Officials from two labs said they identify near-term goals or projects they want to begin, assess whether they have the needed skills on staff, and then hire to fill any gaps that exist.
- Officials from another lab described their workforce planning as “ad hoc” and said they informally anticipate workforce needs over the next few years, such as the need to replace upcoming retirees.
- Officials from two labs said they address near-term needs by training existing staff in new skills, recruiting students to perform the work through NIST’s education programs, or hiring contract employees.

Officials identified shortcomings with their hiring approaches, including:

- Staff may not be nimble enough to learn new skills on a short appointment;
- Staff may experience burnout trying to cover project needs; and
- Contractors take their knowledge and abilities with them on departure, which results in a loss of institutional knowledge.

NIST OHRM’s human capital expertise is not fully integrated into labs’ workforce planning efforts. We have previously reported that high performing agencies align their human capital management systems with their strategic and program planning.⁵⁵ To ensure alignment, HR

⁵⁵GAO, *Human Capital: A Self-Assessment Checklist for Agency Leaders*, OCG-00-14G (Washington, D.C.: Sept. 1, 2000).

professionals should participate as partners with line managers and staff in developing, implementing, and assessing the agency's human capital approaches. NIST's HR officials said they meet with lab managers to discuss hiring strategies. They said they would like to engage more with labs on workforce analysis and planning but need more resources to build capabilities and develop training materials. Without leveraging the knowledge, skills, and abilities of NIST's HR office to integrate these functions, HR officials said labs' planning for workforce needs will remain informal and reactive, and labs may continue to experience challenges with long-term planning.

The absence of a strategic workforce planning process and lack of aligned strategies has hindered several areas of workforce management:

- *Branding.* Officials said NIST faces challenges reaching candidates familiar with its brand, including its mission and its work. According to OPM, developing employment branding and identifying strategic recruitment activities will better position agencies to achieve greater recruiting success.⁵⁶
- *Recruiting.* According to officials responsible for NIST's education outreach efforts, they are not always aware of when labs attend recruiting events, which they described as a missed opportunity to partner and share strategies to help labs recruit. While these efforts may help NIST reach potential candidates, strategic workforce planning could make more efficient use of resources and better align NIST's recruiting efforts with current and future workforce needs.
- *Payment Authorities.* Without a process for tracking the use and success of incentives across labs, NIST is unable to identify the most effective flexibilities for attracting and keeping qualified staff. A strategic approach that measures strategies and includes a data-driven assessment of needed skills and competencies could provide a basis for NIST officials to decide how to maximize the use of payment authorities as a strategy for recruiting and retaining critically needed staff.
- *DEIA Management.* NIST's DEIA Strategic Plan outlines strategies to achieve its DEIA goals, such as addressing barriers to advancement to increase the representation of underserved communities and ensuring an equitable work environment and experience for employees. A strategic workforce planning process aligned with NIST DEIA goals could guide efforts to further cultivate a more diverse and

⁵⁶OPM, *End to End Hiring Initiative*.

inclusive culture, which we previously reported can help reduce turnover, increase retention across demographic groups, and improve morale.⁵⁷

- *Succession Planning.* NIST is limited in its ability to plan around staff departures and ensure program continuity. Hiring managers described a need to reassign staff for critical roles they are unable to otherwise fill, which causes other projects to suffer. With a strategic approach to assess current and future needs, NIST could better target its resources to develop a talent pool for technical and management positions, and plan and implement hiring, development, and retention strategies to achieve such goals.

NIST officials said they are not required to develop a workforce plan, and Commerce HR officials said they do not regularly evaluate how closely NIST follows Commerce's workforce plan, which is intended as a guide. However, OHRM officials said NIST needs to develop an agency-wide strategy to address workforce needs. Several hiring managers said they have experienced losing staff who perform critical roles. It can take months to replace them, which requires projects to be delayed or rebuilt entirely. According to OPM, workforce planning is also an essential tool for aligning budget allocations to human resources requirements so organizations can meet their strategic objectives.⁵⁸ An agency-wide workforce planning process aligned with NIST's strategic goals would help managers ensure the agency's workforce has needed skills and avoids program disruptions that can occur when skills gaps exist.

Conclusions

The highly sought-after skillsets of NIST's S&T staff are critical to ensuring the success of the agency in achieving its mission to advance measurement science, standards, and technology. NIST fully implemented or partially implemented nine leading practices in human capital management pertaining to recruiting and retaining S&T staff. However, it does not track or evaluate the effectiveness of using recruitment and retention flexibilities, has not fully implemented a succession planning framework, and is still taking actions to address the leading practices it has not fully implemented.

⁵⁷[GAO-05-90](#).

⁵⁸OPM, *End to End Hiring Initiative*.

Moreover, NIST does not have an agency-wide strategic workforce planning process that aligns recruitment, retention, DEIA, and succession planning efforts. The absence of a strategic workforce planning process and lack of aligned strategies have hindered the agency in several areas, including in its understanding of the use and effectiveness of recruitment and retention incentives, and its succession planning efforts. An agency-wide workforce planning process aligned with NIST's strategic goals would help ensure the agency's workforce has the necessary skills and avoids program disruptions that can occur from skills gaps.

Recommendations for Executive Action

We are making the following three recommendations to NIST:

The OHRM Division Chiefs should track how often flexibilities have been used—including how often incentive payments have been offered and paid—to evaluate their success. (Recommendation 1)

The OHRM Division Chiefs should develop and implement a succession planning framework, and link leadership development programs and technical training to succession planning efforts. (Recommendation 2)

Directors of NIST's key operating units, including its HR office and laboratories, should collaborate to develop and implement an agency-wide strategic workforce process, which addresses recruitment, retention, DEIA, and succession planning. (Recommendation 3)

Agency Comments

We provided a draft of this report to the Department of Commerce for review and comment. In its comments, reproduced in Appendix II, the Department concurred with our recommendations. In addition, we received technical comments, which we incorporated into the draft, as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Commerce, and the Director of NIST. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-6888 or WrightC@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 III.

Sincerely yours,

A handwritten signature in black ink that reads "Candice N. Wright". The signature is written in a cursive, flowing style.

Candice N. Wright
Director
Science, Technology Assessment, and Analytics

Appendix I: Objectives, Scope, and Methodology

We prepared this report at the request of the U.S. Senate Committee on Commerce, Science, and Transportation. We examined (1) challenges the National Institute of Standards and Technology (NIST) faces in recruiting and retaining a diverse, highly qualified scientific and technical workforce; and (2) the extent to which NIST has implemented leading human capital practices to address its recruitment and retention challenges.

To conduct our work across both objectives, we interviewed human resources and laboratory officials—including hiring managers, leadership, academic affairs, and diversity, equity, inclusion, and access officials—from NIST. We also interviewed stakeholders from the National Academies of Sciences, Engineering, and Medicine (NASEM), which conducts the National Research Council (NRC) Postdoctoral Fellowship and is contracted to publish Consensus Study Reports that assess NIST laboratories. We selected NASEM stakeholders based on their knowledge of the NIST talent pool and familiarity with workforce challenges.

For objective 1, we also:

- Analyzed workforce data, including demographic, hiring, separation, and incentives data. We obtained data from NIST that we analyzed to describe demographic characteristics of the scientific and technical workforce including numbers and characteristics of hires and separated staff and the number and percent of postdoctoral staff hired by NIST at the end of their temporary postdoctoral position. We also obtained data that allowed us to assess NIST's recruitment and retention incentive payments from the years 2017-2021. To assess the reliability of NIST workforce and recruitment and incentives payments data, we reviewed relevant documentation and followed up with knowledgeable officials with questions about these data. We found the data to be sufficiently reliable for the purposes of our reporting objectives.
- Analyzed applicant, award, and post-tenure placement data from the NRC Postdoctoral Program and NIST. We obtained national and NIST-specific data that we analyzed to describe the number of

applications and awards from 2015-2021, as well as the post-tenure assignments for those who completed the program from 2017-2022. We assessed the data for reliability and followed up with knowledgeable NRC program officials about how the data were collected, and with knowledgeable NIST program officials about the accuracy of totals by lab, as well as any discrepancies in post-tenure assignments. We found the data to be sufficiently reliable for the purposes of our reporting objectives.

- Reviewed NIST documentation such as studies assessing gender-specific barriers for women, and equal employment opportunity status reports. Such documentation included four studies and two related NIST guidance documents. We reviewed equal employment opportunity status reports from 2015-2021.

For objective 2, we also:

- Selected leading practices in human capital management to compare them against NIST actions. We identified leading practices from our analysis of 15 GAO human capital products and OPM guidance that reported “leading practices,”¹ “expert-identified leading practices,”² “key strategies and practices,”³ “successful or promising practices,”⁴ and “key drivers of engagement.”⁵ We selected practices based on the relevance of those practices to NIST challenges and actions to address those challenges. In one case, we modified a generally stated practice to better align with NIST’s challenges and actions. Specifically, we modified a leading succession planning practice (Address specific human capital challenges, such as diversity, leadership capacity, and retention) to align with NIST’s

¹GAO, U.S. Secret Service: Action Needed to Address Gaps in IT Workforce Planning and Management Practices, GAO 19 60 (Washington, D.C.: Nov. 15, 2018).

²GAO, Diversity Management: Expert-Identified Leading Practices and Agency Examples, GAO 05 90 (Washington, D.C.: Jan. 14, 2005).

³GAO, Federal Workforce: Key Talent Management Strategies for Agencies to Better Meet Their Missions, GAO 19 181 (Washington, D.C.: Mar. 28, 2019).

⁴Office of Personnel Management, End to End Hiring Initiative (Washington, DC: Mar. 2017).

⁵GAO, Federal Workforce: Additional Analysis and Sharing of Promising Practices Could Improve Employee Engagement and Performance, GAO 15 585 (Washington, D.C.: July 14, 2015).

challenges implementing a succession planning framework and actions to provide leadership development training.

The resulting practice is based on our previous reporting that to assess agency efforts, managers and analysts can look for linkages between succession planning efforts and the agency training plan, such as for leadership development programs that are targeted to help address specific challenges including leadership capacity.⁶ We identified NIST challenges and actions from our review of NIST documentation, including strategic planning and internal guidance documents, and from interviews with NIST officials. We evaluated the extent to which NIST actions implemented, partially implemented, or did not implement each leading practice, based on evidence NIST provided, and how such actions compared to leading practices. For each leading practice, one analyst provided sufficient justification for the extent to which the action followed leading practices and a second analyst concurred.

- Reviewed relevant laws, regulations, and executive orders, such as Executive Order No. 14035 on Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce (June 2021), and compared them against NIST practices.
- Reviewed NASEM Consensus Study Reports from 2017-2021 that assessed all six NIST labs over this timeframe as well as selected divisions within those labs.

We conducted this performance audit from October 2021 to February 2023 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.

⁶GAO, Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government, GAO 04 546G (Washington, D.C.: Aug. 1, 2003).

Appendix II: Comments from the Department of Commerce

**Appendix II: Comments from the Department
of Commerce**



UNITED STATES DEPARTMENT OF COMMERCE
Office of the Acting Chief Financial Officer and
Assistant Secretary for Administration
Washington, D.C. 20230

Candice Wright
Director, Science, Technology Assessment, and Analytics
U.S. Government Accountability Office
441 G Street NW Washington, DC20548

Dear Ms. Wright:

Thank you for the opportunity to respond to the GAO draft report entitled GAO-23-105521, *National Institute of Standards and Technology: Improved Workforce Planning Needed to Address Recruitment and Retention Challenges*.

The Department agrees with the recommendations and will prepare a formal action plan upon issuance of GAO's final report.

If you have any questions, please contact MaryAnn Mausser, Department GAO Audit Liaison, at (202) 482-8120 or mmausser@doc.gov.

Sincerely,

JEREMY
PELTER
Jeremy Pelter

Digitally signed by
JEREMY PELTER
Date: 2023.02.15
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Acting Chief Financial Officer and
Assistant Secretary for Administration

**Department of Commerce's Comments on
GAO Draft Report entitled National Institute of Standards and Technology: Improved
Workforce Planning Needed to Address Recruitment and Retention Challenges (GAO-23-
105521)**

The Department of Commerce has reviewed the draft report and we offer the following comments for GAO's consideration.

Comments on Recommendations

The Government Accountability Office (GAO) made three (3) recommendations to the Department of Commerce in the report.

- **Recommendation 1:** The OHRM Division Chiefs should track how often flexibilities have been used – including how often incentive payments have been offered and paid – to evaluate their success.

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

- **Recommendation 2:** The OHRM Division Chiefs should develop and implement a succession planning framework, and link leadership development programs and technical training to succession planning efforts.

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

- **Recommendation 3:** Directors of NIST's key operating units, including its HR office and laboratories, should collaborate to develop and implement an agency-wide strategic workforce process, which addresses recruitment, retention, DEIA, and succession planning.

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

The Department will provide additional details on planned actions when the final report is issued.

Accessible Text for Appendix II: Comments from the Department of Commerce

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

Dear Ms. Wright:

Thank you for the opportunity to respond to the GAO draft report entitled GAO-23-105521. *National Institute of Standards and Technology: Improved Workforce Planning Needed to Address Recruitment and Retention Challenges*.

The Department agrees with the recommendations and will prepare a formal action plan upon issuance of GAO's final report.

If you have any questions, please contact MaryAnn Mauser, Department GAO Audit Liaison, at (202) 482-8120 or mmausser@doc.gov.

Sincerely,

Jeremy Pelter

Acting Chief Financial Officer and Assistant Secretary for Administration

Department of Commerce's Comments on GAO Draft Report entitled National Institute of Standards and Technology: Improved Workforce Planning Needed to Address Recruitment and Retention Challenges (GAO-23-105521)

The Department of Commerce has reviewed the draft report and we offer the following comments for GAO's consideration.

Comments on Recommendations

The Government Accountability Office (GAO) made three (3) recommendations to the Department of Commerce in the report.

- Recommendation 1: The OHRM Division Chiefs should track how often flexibilities have been used - including how often incentive payments have been offered and paid - to evaluate their success.

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

- Recommendation 2: The OHRM Division Chiefs should develop and implement a succession planning framework, and link leadership development programs and technical training to succession planning efforts.

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

- Recommendation 3: Directors of NIST's key operating units, including its HR office and laboratories, should collaborate to develop and implement an agency-wide strategic workforce process, which addresses recruitment, retention, DEIA, and succession planning.

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

The Department will provide additional details on planned actions when the final report is issued.

Appendix III: GAO Contact and Staff Acknowledgements

GAO Contact

If you or your staff have any questions about this report, please contact Candice N. Wright, Director, Science, Technology Assessment, and Analytics at (202) 512-6888 or WrightC@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report.

Staff Acknowledgments

In addition to the contact named above, Tind Shepper Ryen (Assistant Director), Britney Tsao (Analyst-in-Charge), Carl Barden, Christopher Bowsher, Jenny Chanley, Jehan Chase, Clifton Douglas, Tammi Kalugdan, Mark Kuykendall, Alexia Lipman, Steven Lozano, Joseph Rando, Nihar Vora, Michael Walton, and Clarette Yen made key contributions to this report.

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