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About This Publication

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Executive Summary

The Department of the Navy (DoN) provides a variety of programs to empower and train the next generation of professionals in science, technology, engineering, and mathematics (STEM). The DoN's flagship program, the Naval Research Enterprise Internship Program (NREIP), is a 10-week summer internship for students pursuing post-secondary degrees. Since its inception, NREIP has been providing hands-on learning experiences and mentoring at DoN laboratories located throughout the United States of America.

The DoN invited the Institute for Defense Analyses (IDA) to conduct an in-depth program evaluation of the 2023 NREIP experience. The objectives of the evaluation were to: (1) identify the professional, educational, and other impacts that NREIP is facilitating, and (2) identify any opportunities for improvement. Since the goal of the evaluation was to develop an in-depth and multi-faceted understanding of the 2023 experience, IDA employed a multi-method approach using five sources of data: (1) the "SEAP [Science and Engineering Apprenticeship Program]-NREIP Handbook" provided to all participating laboratories; (2) an inventory of site features that IDA administered to all 2023 locations; (3) comprehensive data on all 2023 applicants; (4) responses to an exit survey administered to all interns; and (5) a set of in-depth interviews that IDA conducted with a stratified random sample of interns.

A summary of key findings and corresponding recommendations may be found below. Findings collectively show that NREIP is a good mechanism for bringing upcoming STEM talent into the DoN to learn about Naval STEM and increase readiness for future educational and professional endeavors.

NREIP helps interns develop their STEM/Technical knowledge and skills.

Interns ranked STEM/Technical Development as the top way in which they grew from NREIP. When IDA asked for detail about how they had grown, interns reported that NREIP helped them apply and refine the technical skills that they were developing in school; provided opportunities to expand into new technical areas; and helped them learn about the research and development process—both in general and in the government. Interviewees attributed gains to the work they did at NREIP, both in the tasks that they executed as well as the people with whom they worked. Mentors were particularly highlighted as key facilitators of learning, since they could teach new material, provide

perspective on Naval STEM, and demonstrate how one navigates the research process. Interviewees also identified several challenges that could limit their STEM/Technical Development, including: mismatch between what they had hoped to work on at NREIP and what they were ultimately assigned, strained relationships with mentors, and bureaucratic hurdles that impeded productivity. To respond to these challenges, NREIP should consider the following recommendations:

- Sites and mentors should align each intern's unique goals to assigned work as much as possible.
- While certain bureaucratic delays are beyond site control, sites should ensure equipment, access provisions, and other necessary resources are secured at least one week in advance.

NREIP helps interns grow and plan their lives as junior professionals.

Interviewees ranked General Professional Development as the second highest area in which NREIP impacted their growth. In particular, NREIP helped them learn how to operate in a professional environment, gain non-cognitive skills, and identify next steps. Interviewees attributed their gains to working in a professional environment and to learning from mentors, STEM professionals, and other interns. While it was unclear how many interviewees were planning on applying for government jobs, findings from the exit survey suggested a strong interest in contributing to the defense industrial base by working either for or with the government in some capacity.

Similar to STEM/Technical Development, gains in General Professional Development could be hindered by strained relationships with mentors. IDA's site analysis found that sites have different levels of training on mentorship, as well as different performance feedback mechanisms, either of which could create inequities across interns with respect to the mentoring they are receiving. Gains could also be tempered by a lack of structured activities at the site. While the exit survey showed high overall levels of agreement from interns about receiving training in core skills, IDA's Site Inventory revealed considerable variation across sites in the types of professional development activities that were provided. Interns were particularly seeking events on how to better navigate the future job market. To that end, NREIP should consider the following recommendations:

- Sites should encourage interns to engage other interns, STEM professionals, and staff as much as possible, since it helps facilitate their professional development.
- The program should develop a set of guidance, training, and expectations for mentors to provide a more equitable mentoring experience across sites.

- The program should set a baseline feedback structure for all interns. Sites should also encourage mentors to provide interns ongoing feedback throughout their experiences.
- Lab-Intern Coordinators should meet with each intern around week 2 or 3 to identify any mentor-related challenges so they may be addressed as early as possible.
- The program should designate a baseline set of professional development activities for all sites to adopt and implement.
- The program should develop a mandatory series that focuses on increasing interns' knowledge of what Naval STEM does and how to apply for various educational and professional opportunities.

NREIP can help interns enhance their professional and social networks under certain conditions.

Interviewees ranked Enhance Professional and Social Networks as the area in which they made the fewest gains at NREIP. IDA also observed that interns tended to rank network enhancements as either their top or bottom impact area, the differentiating factor being whether someone had access to networking events and key gatekeepers (e.g., mentors) that would help facilitate new connections. New ties helped interns gain access to resources, new perspectives, and information about other opportunities in defense. Connecting with fellow interns also helped create a sense of community and belonging. Interviewees attributed enhancements in their networks to regular engagement with others and to structured group events. The absence of either was likewise seen as the reason why networking gains were modest. The attributed importance of group events is particularly noteworthy, since IDA's Site Inventory revealed variation across sites with respect to the number of events offered. To improve this area, NREIP should consider the following recommendations:

- Sites could help facilitate networking through strategic desk placement within the office and by requiring offsite interns to regularly meet with others for both work and non-work purposes.
- At least one professional development activity should focus on networking with people in Naval STEM and/or the defense industrial base.

NREIP receives diverse applications from around the U.S., but faces challenges bringing in a diverse pool of upcoming STEM talent.

Lab-Intern Coordinators communicated that the primary motivation to host NREIP is to identify and develop people for the future workforce. NREIP may face competition in

this pursuit. The applicant analysis revealed that certain applicants were more likely to receive NREIP offers than their respective counterparts: females; upper classmen and graduate students; computer science majors; students with higher grade point averages; and students with prior NREIP experience. Yet, IDA's analysis on who accepts an NREIP offer showed that all of these groups, except people with prior NREIP experience, accepted offers less often than their respective counterparts. Taken together, these findings suggest that members of these groups may be in higher demand in the intern market. The higher offer rates may be interpreted as sites' informal attempts to offset anticipated low acceptance rates, which raises potential risks worth considering. As the program is managed by the Office of Naval Research (ONR), ONR should consider the following recommendations:

- In light of the observed patterns regarding which applicants get offers, ONR should engage Lab-Intern Coordinators to better understand how interns are being selected.
- To better understand the competition, ONR should commission an independent study on why people decline NREIP offers and what they do instead.

NREIP is strong in certain aspects of inclusion, with room to grow in others.

IDA asked interns how well NREIP did in 2023 to foster inclusion. Interviewees varied in how they conceptualized inclusion, with some envisioning a demographically diverse community in which everyone's voices were equally respected and others focusing on the extent to which people with varying conditions were accommodated. On the former, interviewees thought NREIP was strong, though some acknowledged that they did not see as much demographic diversity as they would have wanted. Their impressions were supported by findings from the applicant analysis, which showed that students who identified as Hispanic/Latino or Black/African American were less likely to receive NREIP offers than students who identified as White. Data limitations unfortunately preclude insight into the potential causes of this variation. With respect to accommodations, interns varied in how supported they felt by NREIP since sites differed in the types of accommodations that were allowed. To address these concerns, IDA submits the following recommendations:

- NREIP should continue to project its commitment to inclusion through diverse cohort composition and empowering interns' voices both on projects and during events.
- ONR should commission a study to better understand variation across racial and ethnic groups regarding NREIP participation.

- The program should set policy around the types of accommodations that will be provided to NREIP interns at all sites. The policy should also designate an authority who would adjudicate over unanticipated accommodation requests.

NREIP provides mixed levels of accessibility to support interns from a variety of backgrounds and circumstances.

NREIP has sites located throughout the country, which means a student may have to relocate to their assigned site. The Site Inventory showed that sites differed in the work arrangements that they allowed, with most requiring in-person participation and a substantial minority allowing hybrid. A number of interviewees worked hybrid and appreciated the flexibility. The only concern raised about working hybrid was finding ways of connecting with the people working onsite.

Interns who relocated for the summer were faced with the challenge of finding and affording a temporary residence. The Site Inventory showed that sites varied in the housing support provided to interns, with most sites expecting interns to find something on their own. This expectation is worth considering alongside interview findings, which revealed that the top accessibility concern among interviewees was housing. Securing a short-term rental was easier said than done due to low availability and potentially short search periods. Some sites and mentors tried to help by providing information on possible housing and roommates, which was greatly appreciated. With respect to costs, interviewees were overwhelmingly grateful about the NREIP stipend, but it was not always enough to cover the costs of participation, especially if assigned to a location with a higher cost of living.

Interviewees also described accessibility challenges surrounding transportation to their respective NREIP sites. Most interviewees used personal vehicles to commute to NREIP, since public transportation was either unavailable, too far, or operated at hours that did not overlap with their work schedules. The Site Inventory confirmed interviewees' accounts and showed considerable variation across sites with respect to their proximity to public transportation of any kind. The importance of personal vehicles is noteworthy, since it cannot be assumed that all interns own a car and are able to relocate it to sites. To address these issues, NREIP should consider the following recommendations:

- Sites could expand their use of hybrid and remote work arrangements to better support NREIP's national recruitment strategy.
- NREIP should provide more housing support of some kind (e.g., pre-arranged housing, location adjusted financial assistance). Whichever form of support is selected should be provided at all sites to ensure equity across interns.
- Sites should provide transportation assistance (e.g., carpooling, rideshare fund) for interns who need to commute to a site that is not near public transit and who either cannot drive or have physical mobility limitations. For interns that rely on

public transportation, work hours should be aligned with route schedules. For unusual situations (e.g., working late on a project), sites should provide *ad hoc* transportation assistance (e.g., carpooling, ridesharing).

- Sites should provide information about transportation options and support in the information packet sent to offerees, since it creates an opportunity for interns to work with sites to find solutions as early as possible.

NREIP interns report high levels of overall satisfaction with the program.

The 2023 cohort exhibited high levels of enjoyment with NREIP. Both the interviews and the exit survey showed overall high levels of satisfaction among interns with their experiences. An overwhelming 96 percent of the interns who took the exit survey either "Agreed" or "Strongly Agreed" that they would recommend NREIP to a friend, which speaks strongly to NREIP's overall success as a program.

Contents

1. Introduction

The Naval Research Enterprise Internship Program (NREIP) is a 10-week summer internship for students pursuing post-secondary degrees. The primary mission of NREIP is to provide hands-on learning experiences and mentoring by pairing interns with mentors on Department of the Navy (DoN) projects located throughout the United States of America.

The DoN invited IDA to conduct an in-depth program evaluation on the 2023 NREIP experience. The objectives of the evaluation were to (1) understand the professional, educational, and other impacts that NREIP is facilitating, and (2) identify any opportunities for improvement. Since the ultimate goal of the evaluation was to develop an in-depth and multi-faceted understanding of the 2023 experience, IDA employed a multi-method approach using five sources of data.

1. To understand program-level features, IDA drew upon insights from the public-facing NREIP website. IDA also benefited from a copy of the "SEAP-NREIP Handbook" that the DoN provides to all participating laboratories to describe stakeholder roles and responsibilities and the annual cycle of activities.
2. To understand site-level features, IDA developed and administered a "Site Inventory" to coordinators at all DoN laboratories that hosted interns in 2023 (see Appendix B for inventory). Seventy-three percent of the 2023 sites (n=33) participated in the Site Inventory.
3. To understand the types of people who seek and receive NREIP internships, IDA analyzed a copy of the information provided by applicants along with the DoN's tracking information about who received, accepted, and declined NREIP offers.
4. To understand the impact NREIP had on 2023 interns, IDA analyzed a copy of the interns' responses to an exit survey that the DoN administers to all NREIP interns. The exit survey was completed by 251 interns (a response rate of 43 percent), with representation from 39 of the 45 NREIP sites for 86.7 percent coverage.
5. IDA also conducted qualitative interviews with 37 randomly selected interns to develop a detailed understanding of how NREIP may have impacted their lives (see Appendix B for interview protocol).

Collectively, the five sources of data provided insights about NREIP's various impacts, as well as the broader contextual factors that helped enable these experiences. The chapters that follow present results from IDA's program evaluation. First, we introduce the laboratory sites and discuss how they recruited interns for the 2023 program. As part of this analysis, we provide a nuanced view of the kinds of students who received an offer from NREIP, as well as who ultimately decided to participate.

Next, we present what interns gained from NREIP, along with insights about the types of activities, relationships, and setups that may have helped facilitate these changes. The impact analysis takes a broad and inclusive view of gains, since the function of internships can vary widely across individuals. Part of this chapter considers how NREIP is doing with respect to one of its core goals: "increase DoN STEM internship opportunities for underrepresented groups" (Saxman One 2023). More specifically, IDA draws upon interns' first-hand accounts of how NREIP helped facilitate accessibility and inclusion, as well as what, if anything, could be done to enhance diversity, equity, inclusion, and accessibility (DEIA) going forward.

Finally, the last chapter integrates findings from throughout the report to discuss how NREIP is doing with respect to its core goals: exposing students to STEM careers, activities, and opportunities in the DoN; encouraging students to pursue STEM careers in the DoN; enhancing education through mentoring; enabling students to participate in meaningful STEM research; and increasing participation among underrepresented groups. The report concludes with recommendations for future programming and research that may be done to support NREIP's ongoing progress.

2. What NREIP Provides

To understand the potential impacts of NREIP, it is important to appreciate the context in which the program functions. This section first describes the general program structure, management, and the annual cycle of program actions. We then provide results from an inventory of features completed by most sites that participated in the summer of 2023.

A. The Program

1. History and Mission

The development of NREIP goes back to the early 2000s. The sites that participate in NREIP are located at various DoN facilities, including the Naval Warfare Centers, the Bureau of Medicine and Surgery, the Marine Corps Warfighting Lab, the Naval History and Heritage Command, and others.

The goals of NREIP are to "encourage students to pursue DoN science and engineering (S&E) careers, enhance education with mentoring by laboratory scientists and engineers, enable students to participate in meaningful STEM research, expose students to DoN science & technology and research & development opportunities, and increase DoN STEM internship opportunities for underrepresented groups" (Saxman One 2023). The intent of NREIP is aligned with Naval STEM's broader mission: "Deliver Naval STEM education and outreach opportunities that inspire curiosity and shape a generation of talent prepared for future global challenges (Naval STEM Coordination Office 2023).

2. Management and Stakeholders

IDA developed an understanding of how NREIP is managed from a combination of the NREIP Handbook (Miranda et al. 2022), the NREIP website (Saxman One 2023), and insights shared by program representatives. Understanding NREIP's structure helps inform the evaluation by clarifying where actions occur (i.e., who is responsible for what), as well as how such actions may influence program execution.

NREIP's roles and responsibilities are distributed across an interdependent community of stakeholders and organizations. There are four primary stakeholders that each have their own roles and responsibilities, but must also rely upon each other to ensure NREIP's success.

1. Office of Naval Research (ONR)— NREIP receives oversight from the Naval STEM Coordination Office and management from Code 34 Warfighter Performance, both of which are in ONR. ONR also provides program coordination, policy, and guidance. Lastly, ONR leads NREIP's outreach efforts, with support from Saxman One.
2. Sites—the Naval Labs and Warfare Centers where NREIP takes place. Sites provide the mentors and projects that interns engage during NREIP. Each site also has a Lab-Intern Coordinator or other staff member who helps supervise the mentor-intern partnerships. The sites that participate in NREIP may vary each year, since participation is contingent upon whether mentors want and are able to match with an interested and qualified applicant.
3. Saxman One—a contractor that supports a variety of NREIP's administrative functions, such as coordinating the application process and managing the online portal where Lab-Intern Coordinators and mentors review applications and select interns. Saxman One also provides data management services and maintains NREIP's online presence (website, social media accounts). Many sites also receive coordination support from Saxman One on the security clearance process for incoming interns.
4. Interns—the students who complete internships at DoN facilities through the program.

3. Funding

NREIP receives funding from two primary sources. ONR funds NREIP's standard functions through Budget Program Element 0601153N ("Defense Research Sciences"). Sites provide the remainder of the funding which, in some cases, is quite substantial. Several sites serve as the primary financial supporters for their respective NREIP activities.

4. Annual Operations Cycle

Program activities are organized into a year-long cycle with seven phases:

1. Pre-application Phase—ONR determines the program requirements for the year and individual Labs/Centers identify the types of students they are looking for as interns. Also, during this phase, ONR and the program contractor, Saxman One, conduct nationwide outreach and marketing to attract people to apply to the program, while sites may conduct some local, regional, and national outreach.
2. Application Phase—The program contractor sets up a web-based application portal so students can apply. During the application phase, the Lab-Intern Coordinators and the program contractor answer questions from applicants to help facilitate the process.

3. Pre-award Phase (Selection)—Lab-Intern Coordinators engage members from their respective sites to review, evaluate, and select applicants in the portal. If desired, sites may also contact and interview potential candidates as part of the evaluation process. After sites make their determinations, the program contractor sends a notice of award to selected applicants.
4. Award Process—The program contractor notifies applicants of awards and applicants indicate if they accept/decline.
5. Pre-internship Phase—The onboarding process starts with Lab-Intern Coordinators developing plans for interns who accept NREIP offers. Mentors also begin developing individualized intern plans for the incoming cohort. Saxman One (or, in some cases, the sites) initiates security clearance processes to provide interns with Common Access Cards (CACs), base or facility access, and appropriate building provisions. ONR provides an annual training and presentation on lessons learned for Lab-Intern Coordinators.
6. Internship Phase—Lab-Intern Coordinators communicate each intern's start and end dates to the program contractor in order to set up the stipend disbursement schedule. Interns attend orientations provided by sites, work with mentors and others on projects, and participate in any enrichment events their site may offer. Interns develop and deliver final presentations on their NREIP accomplishments for an audience curated by mentors and other site representatives. The standard length of an internship is 10 weeks, usually starting in late May or early June, with an option to extend the internship up to an additional four weeks. Towards the end of the program period, interns also voluntarily participate in an exit survey that is developed and administered by NREIP. Interns complete the program through a final closeout process that is managed by sites.
7. Post-internship Phase—Lab-Intern Coordinators submit reports to ONR, detailing what was accomplished during the internship. Reports include copies of interns' exit survey responses, as well as any quad charts interns may have included in their final briefings.

As the cycle illustrates, the success of NREIP requires stakeholders to collaborate and coordinate on a variety of program activities. This is challenging under any conditions, but all the more so when stakeholders are geographically distributed across the country. As an added layer of difficulty, stakeholders may change each year due to routine personnel turnover, plus variability in: which mentors are interested in working with interns; which

sites have mentors that are hosting interns; and which students are recruited as NREIP interns.[1]

B. Inventory of Sites

NREIP has a decentralized and distributed structure in which activities are hosted at sites nested within warfare centers, systems commands, laboratories, and research units across the DoN. As of spring 2023, there were 50 sites eligible to host NREIP interns. The summer 2023 program took place at 45 sites located throughout the United States. To gain a better understanding of their capabilities, IDA developed and administered a Site Inventory to Lab-Intern Coordinators from all sites participating in the 2023 program (see Appendix B for the Site Inventory). Thirty-three sites contributed information in varying degrees. In the following sections, we draw upon an analysis of their responses to examine how sites contribute to NREIP. We begin by discussing sites' motivations for hosting NREIP along with how their intentions line up with capabilities. Next, we examine NREIP from the perspective of its geographic accessibility for students. Lastly, we introduce sites' core activities with respect to NREIP, to include mentoring, professional development activities, and group social events.

1. Motivations for Hosting NREIP

To understand what sites seek to gain from hosting NREIP, IDA asked Lab-Intern Coordinators to, "briefly describe the main reason your site participates in NREIP." Since IDA used an open-ended question format, Lab-Intern Coordinators were free to share as many reasons as relevant. Three types of motivations emerged from their responses.

Among the 26 Lab-Intern Coordinators who provided information, the most common type of motivation was to enable the pipeline for future hiring. For example, one Lab-Intern Coordinator said that their site hosted NREIP "to build a pipeline of STEM professionals to fill our future vacancies." Another Lab-Intern Coordinator said that NREIP provides a "great opportunity for the student and for our command to see if the relationship is good for a long-term commitment." A third Lab-Intern Coordinator viewed NREIP as a contributor to future hiring because it facilitated "networking with students who are interested in supporting Navy R&D," and helped "develop relationships for potential follow on employment."

The second most common type of motivation for hosting NREIP was to support various aspects of interns' growth. Some Lab-Intern Coordinators highlighted the intrinsic value of cultivating the next generation of STEM professionals. For example, one Lab-Intern Coordinator stated that their site participated in NREIP "to educate and give

[1] As discussed in Chapter 3, NREIP recruits both new and returning interns. In 2023, most interns were participating in NREIP for their first time.

experience to future professionals." Another Lab-Intern Coordinator likewise framed NREIP as "furthering the technical development of students who will enter STEM career fields."

Other Lab-Intern Coordinators saw NREIP as a useful way to develop interns for the Navy. For example, one person said that their site hosts interns because it "provides a great opportunity to create an interest in the student for our Navy work and mission." Another Lab-Intern Coordinator said that NREIP "offers students real hands-on experience they would not get in the classroom. And the more educated our youth, the more it will benefit our national security."

The last type of motivation that Lab-Intern Coordinators offered was supplementing the existing workforce. For example, one person stated that, "Interns are high capacity employees. The cost per intern is very reasonable." A couple of other Lab-Intern Coordinators saw NREIP as a way of getting "bright" or "high-quality" labor to support their projects. For example, one Lab-Intern Coordinator stated that NREIP is a way to "leverage bright students to get additional work done at the command." Another person listed "the high quality of the NREIP interns, the energy they bring for the summer, and the chance to mentor eager students with a bright future" as the main reasons for their site's participation.

Collectively, the motivations that Lab-Intern Coordinators shared emphasize NREIP's role as a potential workforce multiplier in several ways. In the near term, interns augment the existing workforce by providing low cost and high value labor to Navy projects. In the long term, NREIP contributes to the broader Naval workforce by introducing interns to Navy careers and by allowing sites to develop potential future employees through training and experiences.

With all of the motivations for participating in NREIP having some connection to the idea of contributing to the future workforce, IDA next examined how sites might convert successful NREIP interns into permanent employees. IDA asked Lab-Intern Coordinators to identify the types of hiring mechanisms that were available at their respective sites (Figure 1). Lab-Intern Coordinators from 32 sites shared information.

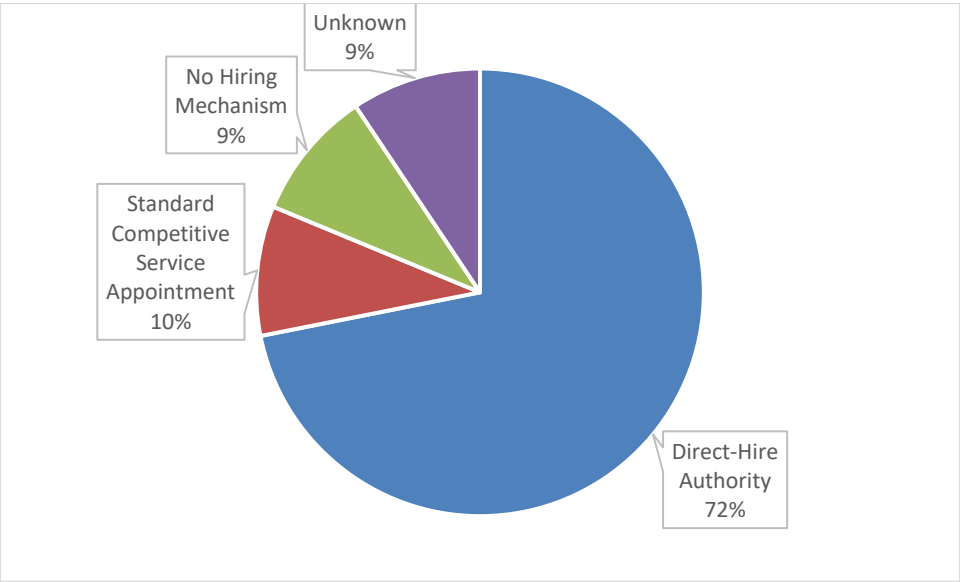

Figure 1. Proportion of responding sites (n=32) with various hiring capabilities.

The analysis revealed that very few sites (9%) do not have some type of hiring mechanism for former NREIP interns to pursue should they seek full-time employment with the DoN (Figure 1). Approximately 10 percent of the sites are able to hire former interns through a Standard Competitive Service Appointment, which means they would undergo the same application and hiring process as other qualified members of the public.

However, most sites (72%) are able to hire former interns through Direct-Hire Authority,[2] which expedites hiring by streamlining some of the application, rating, and ranking (e.g., veterans' preference placements) procedures of the Standard Competitive Service hiring process. While not shown in the chart above, it is also worth noting that most of the sites with Direct-Hire Authority indicated that they can also hire former NREIP interns, "Through another government education/training program (e.g., Pathways Internship and Recent Graduate Programs)." These types of programs may place people into government positions on a trial basis, after which they can transition into more permanent positions without having to recompete. Lab-Intern Coordinators at the remaining sites (9%) did not know what types of hiring mechanisms, if any, were available for bringing on former interns.

Collectively, results show that the sites, in general, can back up their motivations for hosting NREIP with actual capabilities. A large number of the Lab Coordinators talked

[2] Direct-Hire Authorities are mechanisms that expedite the hiring process and are granted to specific DoD programs and organizations to fill specific needs. For additional information, see https://www.hci.mil/docs/DoDAcquisitionWorkforceHiringAuthorities_FINAL_HCI_Apr2020.pdf.

about hiring as a motivation for NREIP, and a vast majority of the sites have at least some mechanism for making that a reality.

2. Geographic Accessibility

Students who receive NREIP offers must consider the logistical feasibility of participating. One of the factors that impacts feasibility is the geographic accessibility of program activities. Figure 2 illustrates where the 2023 NREIP sites were located (each site indicated by a red dot). The map reveals that NREIP 2023 has a presence in 18 states.

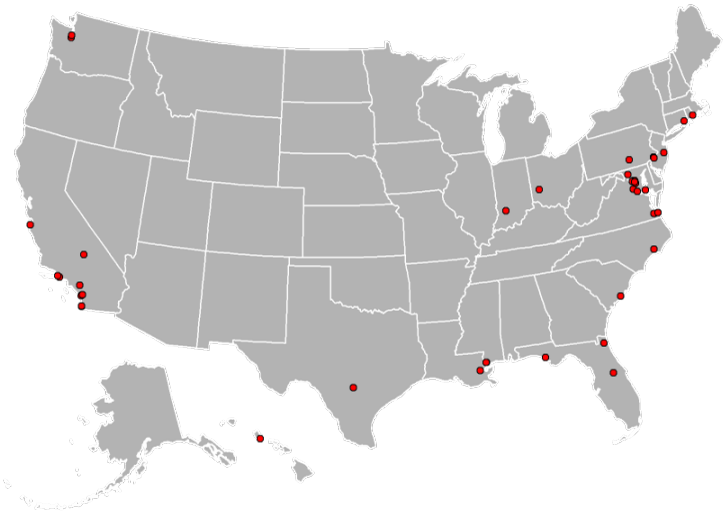

Figure 2. Site locations for NREIP 2023.

At least one site may be found in the Western, Pacific Northwestern, Southern, Mid-Atlantic, Northeastern, and Midwestern regions, though they tend to be more common in coastal areas. The map also reveals concentrations of sites in the Washington metropolitan area (District of Columbia, Maryland, Virginia), as well as in California. NREIP is open to applicants from anywhere in the United States and territories, provided they meet various eligibility criteria (e.g., U.S. citizenship).

Having sites located in as many places as possible throughout the United States is a good first step towards accessibility, since not all students are able to relocate for the summer. Students may have families, part-time jobs, or other obligations that make it difficult to leave for an extended period of time. Other students may be unable to afford a second residence for the summer. This type of concern is important for students living in rentals that do not allow them to sublet or pause the lease. Should someone in this situation have to relocate to one of the sites, they would have to be able to afford rent both at home and at the NREIP location.

To gain a sense of how less mobile students would be able to participate in NREIP, IDA collected information about the types of work arrangements that sites offer. Twenty out of the 32 sites that answered the question on the Site Inventory (63%) require interns to participate in-person for the entire duration of the program. Eleven sites (34%) indicated that they offer hybrid options that allow interns to split their time between working on site and remotely. Only one site in the sample (3%) indicated that they allow interns to work fully remotely.

IDA also asked Lab-Intern Coordinators about a few practical matters that can impact feasibility, especially if expected to participate in person. First, IDA asked how each site's interns find housing, since it can be challenging to find safe and affordable housing if one is unfamiliar with the area. The choices were: "program housing;" "summer sublet, rental, or other independent housing;" "stay with friends or family in the area;" and "other (please specify)." Four out of the 32 sites that answered the question used the "other" option to share that they only select interns from local areas, so interns simply maintain their current housing. It is unclear whether this reflects formal policy or an informal practice intended to prevent undue burden on less proximate applicants. Two sites offered "program housing" by arranging for interns to stay in a nearby dorm or something similar. This type of support spares interns from having to find safe and affordable housing from afar.

The remaining 26 sites expected interns to find somewhere to stay on their own, whether through independent housing (e.g., summer sublet, rental) or by staying with friends or family in the area. While the self-starter approach works well for interns who prefer having control over where they stay, it is important to remember that these options are not equally available to all potential interns. Some students may not be able to afford rental prices in the open market, for example. And not every student has friends and family near one of the NREIP sites with whom they might stay.

Lastly, IDA asked about proximity to public transportation, since interns may not have access to a car; for example, if economically disadvantaged or coming from out of state. On the Site Inventory, Lab-Intern Coordinators were asked how long it takes to walk from their respective sites to the nearest public transportation of any kind. Results show that sites vary considerably in their proximity to public transportation, with a walking time of 1–1,000 minutes and a median time of 15 minutes from the site to the nearest public transportation. Since the walking time of 1,000 minutes was an outlier, IDA also organized commute times into brackets (Figure 3). Of the 31 sites that answered the question, 55 percent reported that their lab or facility was within a 15-minute walk of public transportation, with half being only 5-minutes or fewer away. Approximately 22 percent of the sites were within a 16- to 30-minute walk, while the remaining 23 percent were 31 minutes or more away from public transportation.

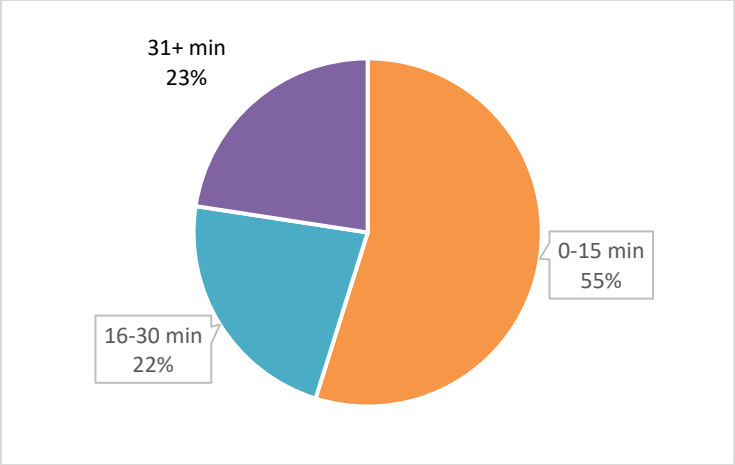

Figure 3. Walking time from site to nearest public transportation.

Taken together, NREIP's locations, work arrangements, housing support, and transportation options represent a mixed level of geographic accessibility for students interested in NREIP. Local students enjoy a high degree of accessibility to NREIP, since they are able to capitalize upon their existing housing and transportation resources. In this regard, it is not surprising that certain sites limit their recruitment to local areas.

IDA's analysis revealed that students coming from afar may experience several accessibility challenges, especially since most programs require in-person participation. They must be in a position to leave competing obligations for a period of time, which may be more difficult, for example, among single parents or caretakers. Since most sites do not provide program housing, students coming from afar also have to find a safe place to stay in a potentially unfamiliar area. It is important to remember that some students may not be able to afford the cost of housing near NREIP, especially if coming from a place with a lower cost of living. Students who spend the academic year in rentals that do not allow sublets would have to be able to afford a second rent near the NREIP site, which may not be feasible for economically disadvantaged students.

Whether local or coming from afar, interns also have to find a way to commute to their assigned sites for work. With almost half of the sites being more than a 15-minute walk from any type of public transportation, it would be difficult to commute without a car, especially during inclement weather. Interns from the local area may already have access to a car, though this is not universal considering the current high cost of having and maintaining a vehicle. Interns coming from afar are even less likely to have access to a car, since the cost of driving or transporting one's car long distances can be prohibitively expensive.

One of NREIP's strengths is that it inclusively welcomes talent from anywhere in the United States and territories. However, national recruitment comes with logistical tradeoffs that are important to help interns navigate. With most sites requiring some degree of in-

person participation, it will be important to find ways of supporting students who are coming from further away and have financial, familial, physical, or other constraints on their mobility. When practical, it is worth considering whether accessibility could be expanded by alternative work arrangements and other forms of support (please see Chapter 6 for recommendations) that would empower interns to engage the NREIP community without unnecessary burden on other aspects of their lives.

3. Site Activities

IDA also sought to gain a high-level understanding of the types of activities found at each site. As such, the Site Inventory included questions about mentoring, professional development opportunities, and group social events.

a. Mentoring

One of NREIP's core goals is to "enhance education with mentoring by laboratory scientists and engineers." To this end, NREIP sites pair each summer intern with a Navy employee who serves as a mentor and supervisor. NREIP mentors may be government employees, contractors, or any other staff who work for the DoN.

Mentors are typically volunteers, in the sense that NREIP-related activities are undertaken in addition to their primary job responsibilities. Consequently, the amount of time mentors can devote to interns may vary considerably. To gain a sense of how much mentoring support was available, the Site Inventory asked Lab-Intern Coordinators to indicate approximately how many mentors were *available* at each site.[3] IDA then paired this information with the number of interns per site to calculate the intern-to-mentor ratio.

Findings show that, across the 32 sites for which data were available, an average of 1.2 mentors were available per intern. At nine sites (28%), there were fewer mentors than interns, which suggests interns had to share their mentor's attention (e.g., one mentor supervising two interns). However, most sites (72%) had at least one mentor available to support each intern. The largest ratio observed was at a site where five mentors were available per intern. It is unclear whether this reflects co-mentoring practices or whether the interest in mentoring simply outpaced the supply of available interns.

Mentoring involves skillsets that do not necessarily overlap with one's abilities as a scientist or professional. As such, mentorship training, coaching, and experience can impact what interns gain from the relationship. To understand how NREIP helped its 2023 mentors prepare for interns, IDA asked Lab-Intern Coordinators, "What types of training or guidance, if any, will your site's new 2023 NREIP mentors receive on how to mentor

[3] The number of mentors that are *available* per intern is being used, instead of the number of mentors that were actually *assigned* to each intern, since the latter was not included in the dataset.

interns?" Lab-Intern Coordinators were then able to select as many of the following as appropriate: "None," "Informal handout or other instructional material," "Group training session," "Informal guidance from previous mentors," or "Other."

Thirty-two sites provided insight into how they help their mentors prepare for working with interns. IDA organized responses by the overall extent to which mentors received some type of training or guidance (Figure 4). Sites that had some type of organized training, whether a "Group training session" or something similar, were categorized as having "Structured Mentorship Training." Sites that provided mentors an "informal handout or other instructional material," but did not hold some type of organized training session, were categorized as having "Less Structured Mentorship Training." The remaining sites were categorized as having "No Mentorship Training," since mentors were expected to either figure things out on their own or gather "informal guidance from previous mentors." Since almost half of the sites selected multiple training methods, each site was categorized based on its most structured training method (e.g., a site that indicated both "Group training session" and "informal guidance from previous mentors" was put into the Structured Mentorship Training category). Sites that responded "Other" were placed in the appropriate category by interpreting their response.

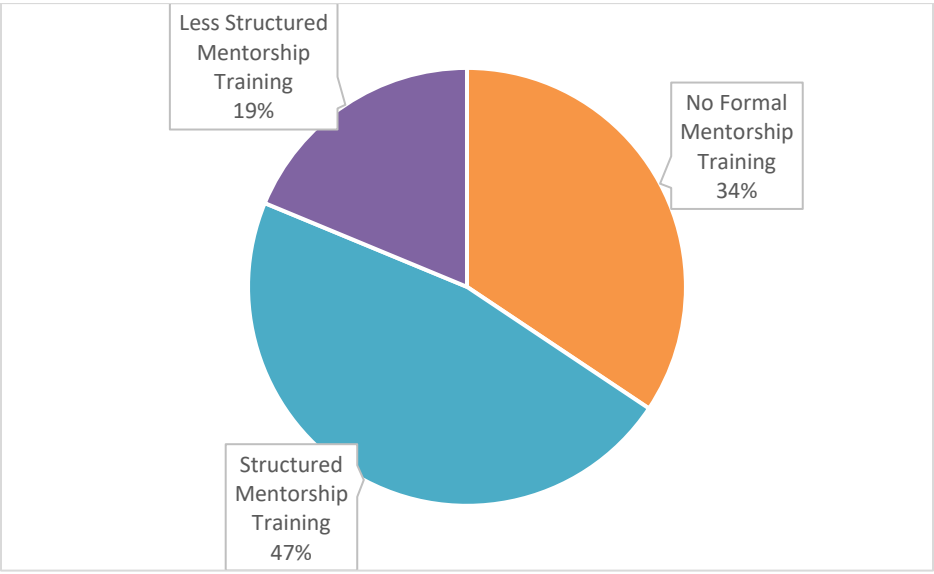

Figure 4. Mentorship training at NREIP sites.

Eleven sites (34%) indicated that they had "No Mentorship Training." Breaking this category down into detail, two sites used the "Other" category to report that they did not have mentorship training because this year's mentors had supported NREIP previously. Seven sites expected mentors to learn about mentoring by gathering "informal guidance from previous mentors." At the remaining two sites, new mentors were expected to figure things out on their own (i.e., the Lab-Intern Coordinators selected "None").

The 11 sites that had "No Mentorship Training" were in the minority, since most sites provided some type of training or guidance to their mentors. At 15 of the 32 sites that provided information (47%), there was some type of "Structured Mentorship Training." More specifically, two sites trained mentors through "Individual Q&A Sessions" (written-in response), while the other 13 sites held a "Group training session" on mentorship.

The last six sites that provided information about mentorship training (19%) were categorized as having "Less Structured Mentorship Training." All of these sites distributed some type of "informal handout or other instructional material" to their mentors. Some sites used additional methods as well. At one site, it appears that one or more of the mentors had previously worked for NREIP, since mentors were expected to rely upon a combination of "prior experience" (written-in response) plus the "informal handout or other instructional material." Two sites reported that their mentors gathered "informal guidance from previous mentors," in addition to learning from the "informal handout or other instructional material."

Taken together, the strong intern-to-mentor ratio and high prevalence of mentorship training or guidance suggests that NREIP is well positioned to provide enriching mentoring experiences for its interns. It is notable, nonetheless, that sites vary considerably with respect to the amount and type of training provided to mentors. What remains unclear is the extent to which mentors feel they have the tools they need to support NREIP interns. An absence of "Structured Mentorship Training," for example, could be interpreted as an opportunity to help NREIP mentors better prepare for interns. On the other hand, the absence could simply reflect the presence of mentors that already have the experience and demonstrated expertise they need to support incoming interns. Since mentoring proved to be a pivotal factor in shaping interns' perceived outcomes (see Chapter 4, What Interns Gain from NREIP), it would be worth considering future research on specific mentoring practices and their effects.

b. Professional Development

In addition to providing mentoring, NREIP sites organize a variety of professional development activities to help interns grow. To gain a better understanding of what sites do more specifically, IDA used the Site Inventory to collect information on whether they were doing any of the following for the 2023 interns: "Group Instruction," "Individual Instruction," "Seminars and Guest Speakers," or providing some type of "Information Handout or Other Instructional Material." Lab-Intern Coordinators were invited to select as many options as appropriate.

Table 1. Number of Sites Offering each Professional Development Activity

Professional Development Activity	Number of Sites
Group Instruction	27
Individual Instruction	23
Seminars & Guest Speakers	20
Information Handout or Other Instructional Material	15
Other	5
None	0

Note: Lab-Intern Coordinators were able to select as many topics as relevant, so the total number exceeds the number of sites that provided information for this question (32 sites).

Thirty-two sites contributed information on professional development activities. Analysis of their responses reveals that most sites provided some type of structured learning opportunity for 2023 interns. In order of prevalence, 27 sites (84%) offered "Group Instruction," 23 sites (72%) offered "Individual Instruction," and 20 sites (63%) hosted "Seminars and Guest Speakers." Fifteen sites (47%) also indicated that they supported interns' growth using an "Information Handout or Other Instructional Material." Since all 15 of these sites also supported interns through "Group Instruction," "Individual Instruction," or both, the handouts were likely supplemental. Finally, five sites used the open-ended "Other" option to report that they also provide tours and other field trips to support interns' professional development. All sites indicated that they offered at least one type of professional development activity.

To further understand NREIP's professional development activities, IDA also asked Lab-Intern Coordinators to indicate the types of topics that are covered. Lab-Intern Coordinators were invited to select as many options as appropriate for their respective sites. Again, 32 sites provided information.

Table 2. Number of Programs Addressing Each Professional Development Topic

Professional Development Topic	Number of Sites
Science Skills & Knowledge Areas	27
Presentation Skills	26
Networking	19
Time Management	14
Resume Building	13
Writing	10
Other	4
None	1

Note: Lab-Intern Coordinators were able to select as many topics as relevant, so the total number exceeds the number of sites that provided information for this question (32 sites).

The analysis revealed that 27 out of 32 sites (84%) provide professional development activities focused on helping interns' grow their "Science Skills and Knowledge" (Table 2). Sites also provided training in non-cognitive or "soft skills," such as 26 sites training "Presentation Skills" (81%), 10 sites "Writing" (31%), and 14 sites "Time Management" (44%). Consistent with NREIP's broader focus on cultivating the STEM pipeline, 19 sites (59%) helped with "Networking" and 13 sites (41%) helped interns with "Resume building." Four sites used the "Other" option to write in that they help interns with things like mentoring, interviewing techniques, and workplace etiquette. Only one site indicated that they do not address any of the professional development topics that were included on the Site Inventory. That site did not provide any additional context using the write-in option, so IDA cannot speak to which topics they are covering.

To enhance program impacts, whether in STEM or in professional development capacities, it can be helpful to provide constructive feedback to interns. IDA asked each Lab-Intern Coordinator to indicate which of the following feedback mechanisms they plan to use with their 2023 NREIP interns: "None," "Ongoing Feedback Throughout," "Interim Evaluation Meeting," and "Final Evaluation Meeting." Lab-Intern Coordinators were also able to select "Other" and use a text box to elaborate. None of the written-in responses that were provided indicated an additional feedback mechanism.

To explore how sites may vary with respect to the feedback they offer interns, IDA next organized the sites' responses into three types of feedback strategies: "no feedback mechanism," "single feedback mechanism," and "multiple feedback mechanisms." Results (see Table 3) show that only 5 sites (16%) out of the 31 sites that answered the question were not planning on providing some type of feedback to the 2023 interns. Nine sites (29%) exclusively focused their feedback using a single mechanism. At eight of these sites, the single mechanism employed was "Ongoing Feedback Throughout," whereas the ninth site exclusively gave feedback through a "Final Evaluation Meeting."

Table 3. Number of Sites Using Each Feedback Strategy

Feedback Strategy	Number of Sites
No Feedback Mechanism	5
Single Feedback Mechanism	9
Ongoing Feedback Throughout	8
Interim Evaluation Meeting	0
Final Evaluation Meeting	1
Multiple Feedback Mechanisms	17
Ongoing + Interim	1
Ongoing + Final	9
Interim + Final	0
Ongoing + Interim + Final	7
Total # of Sites Providing Information	*31*

Seventeen out of 31 sites (55%) gave feedback to interns using multiple mechanisms. Of those sites, one held an "Interim Evaluation Meeting" and provided "Ongoing Feedback Throughout." Nine sites held a "Final Evaluation Meeting" and provided "Ongoing Feedback Throughout." And, the last seven sites supported interns through a combination of an "Interim Evaluation Meeting," a "Final Evaluation Meeting," and "Ongoing Feedback Throughout."

Overall, the most commonly selected feedback mechanism was "Ongoing Feedback Throughout," with 25 (81%) out of 31 sites indicating its usage. In order, the next most common mechanisms were: 17 sites providing a "Final Performance Evaluation" (55%), 8 sites used "Interim Evaluation Meetings" (26%), and 5 sites (16%) indicated no mechanism for feedback. It is noteworthy that so many sites either leverage "Ongoing Feedback Throughout," either exclusively or in conjunction with other feedback mechanisms, because it requires mentors to closely monitor interns' activities and progress each step of the way. The benefit of this strategy is that interns have the ability to course correct or accelerate their learning in a timely manner. However, it is unclear whether all mentors are equally available for and interested in providing ongoing feedback, especially since NREIP mentors are volunteer-based and receive varying degrees of training.

Collectively, findings suggest that NREIP is well positioned to provide a multi-faceted learning experience for summer interns. Most sites provided one or more structured learning activities, rather than expecting interns to exclusively learn on their own. While a certain degree of self-directed learning is likely occurring—and not necessarily problematic—the incorporation of structured learning opportunities enables NREIP to help a wider variety of learners. From a topic perspective, most sites are focused on helping interns develop their STEM knowledge and skills, as well as their non-cognitive skills.

Learning experiences such as internships would not be complete without some type of feedback mechanism. IDA's analysis revealed that most sites are approaching this requirement using multiple feedback mechanisms. Most commonly, sites employed a combination of one or more structured feedback meetings plus unstructured feedback on an ad hoc basis. The benefit of providing ongoing feedback throughout is that it helps interns address any issues they may have encountered as early as possible. However, it places the onus of monitoring on mentors whose attention may be otherwise allocated. IDA also found it noteworthy that sites varied in the type of structured feedback that they provided, with some sites incorporating "Interim Feedback Meetings," other sites relying upon "Final Evaluation Meetings," and still others doing both. Given the expected variation around how often mentors will provide unstructured feedback, it might be worth standardizing the structured feedback mechanisms to ensure all NREIP interns receive the same level of support.

c. Social

The internship experience does not consist solely of work-related tasks. By bringing people together for shared activities, internships can also help students connect with each other to form bonds, find support, and expand their networks. To gain a sense of how sites may help to facilitate bonding, IDA asked Lab-Intern Coordinators, "Approximately how many group social activities (e.g., field trip, potluck) will your site organize for the entire 2023 NREIP cohort at your location?" Lab-Intern Coordinators were then invited to write-in the appropriate number.

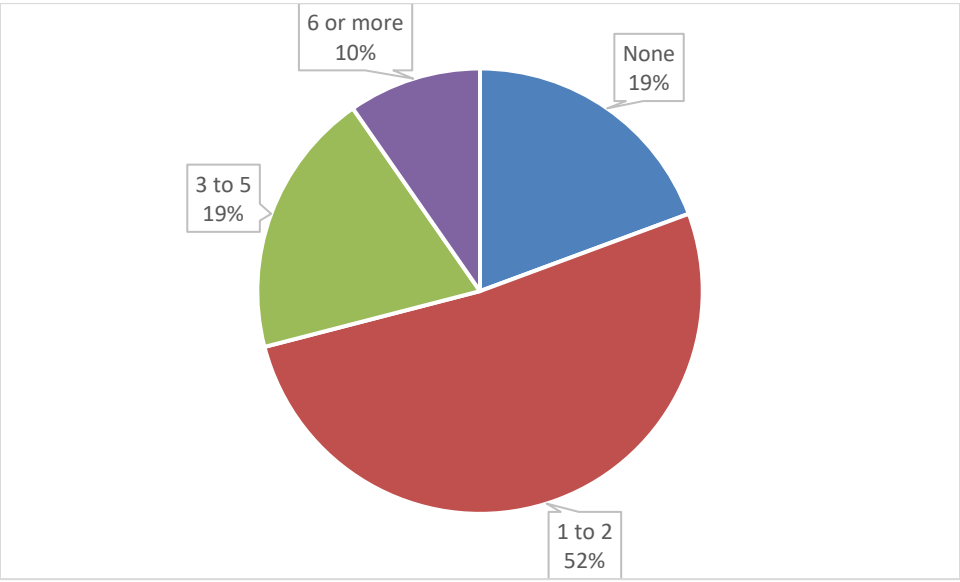

Figure 5. Number of group social activities organized by sites.

Thirty-one sites provided information on the number of group social activities that they host. Analysis of their responses (Figure 5) shows that a little over half of the sites (52%) reported organizing either one or two group social activities for interns. Nineteen percent of the sites reported organizing between three to five group social activities, while 10 percent of programs organized six or more, and the remaining 19 percent of sites did not organize any group social activities.

IDA's analysis revealed a great deal of variation across sites in the number of group social activities that were offered. The number of activities ranged from 0 to 11, with an overall average of 2.6 group social activities per site. It is difficult to interpret this variation on its own, since the Site Inventory did not gather more detail about what the group social activities entailed. However, findings from the interview analysis (see Chapter 4, What Interns Gain from NREIP) suggest that the type of activity may ultimately be less important than the act of gathering interns together to connect, network, and offer mutual support. In this regard, it is noteworthy that some sites did not organize any group social activities. It is possible that some of those cases were situations in which there was only one intern at the site. Under such situations, it would be worth considering a mixed group social activity that integrates both the intern and government employees. Alternatively, if there are other interns at nearby locations, one could consider group social activities for interns from multiple sites.

C. Summary and Recommendations

Starting from the early 2000s, NREIP has been hosting interns at Naval Labs and Warfare Centers across the country. The structure of the program consists primarily of four interdependent stakeholders: ONR, the Naval Labs & Warfare Centers, Saxman One (the program contractor administrator), and the interns. The program has a year-long cycle that includes: pre-application actions, like determining needs and conducting outreach; an application period for interested students; an assessment of applicants to determine awards; pre-internship planning at Labs/Centers and initiation of security clearance process; ONR-provided training for Lab-Intern Coordinators; the actual internships; and then post-internship processes, which include sites reporting back to ONR and students completing exit surveys.

The sites that participated in 2023 and completed the inventory indicated that they were motivated by benefits both to the lab (by introducing potential future hires to the site) and the intern (by educating and giving them experience). Taken together, these motivations speak to NREIP's value as a force multiplier for the future DoN workforce.

From a structural standpoint, sites had mixed levels of accessibility for students, especially since most sites required interns to participate in person and find their own housing. More on NREIP's accessibility, to include interns' perspectives gathered through interviews, may be found in Chapter 5. There are a few ways that NREIP could be adapted

to facilitate participation by those that may have some difficulties with the program's structure. In particular, the Site Inventory revealed a few areas where changes could be helpful, such as expanding support to aid students who may not otherwise be able to participate. Some examples of the type of support that NREIP could provide are:

- Alternative work arrangements, such as hybrid or fully remote work
- Housing assistance, both financially and in finding locations
- Transportation assistance (such as carpooling or a rideshare fund) for students who cannot drive and need to commute to a lab that is not near transit
- Moving assistance for students who have to relocate long distances

From an activity standpoint, the 2023 sites emphasized mentoring capabilities, with an average of 1.2 mentors per intern and many mentors undergoing training. Sites also worked to help interns grow over the summer with structured professional development and learning activities, as well as ongoing feedback. Some sites also worked to encourage intern-to-intern social engagement by organizing group social activities. Overall, the sites were focused on bringing in a range of interns and helping them grow professionally into the type of researchers who could become future employees.

Additionally, there are a few other areas that sites could potentially increase focus on during the internship. To promote consistency in the mentorship that interns receive, it would be worth considering a unified set of guidance and training for mentors at all sites. Interns could also receive more direction on navigating the future job market. Lastly, the ways that students receive feedback could be standardized throughout the program to make sure that all interns are receiving ongoing, constructive feedback.

3. Recruiting and Selecting Interns

This chapter examines who becomes NREIP interns. Specifically, IDA traced the application and selection process to understand what kinds of students apply, receive offers, and decide to participate in NREIP. The analysis was organized into chronological stages that address the following questions:

1. **Applicants**
    - What are the characteristics of students who applied for the NREIP 2023 summer session?
    - How do applicants compare to the broader populations of post-secondary college students and STEM degree recipients in the U.S.?
2. **Offerees**
    - Among the applicants, what types of characteristics were associated with a higher likelihood of receiving an offer for the NREIP 2023 summer session?
3. **Interns**
    - Among the offerees, what types of characteristics were associated with a higher likelihood of accepting NREIP offers to become interns in the 2023 summer session?

In the sections that follow, IDA provides the results, along with reflections on how to interpret key findings.

A. Who Applies to NREIP

This section examines the application process and the characteristics of the people who applied to NREIP in 2023. After a summary of the types of information captured by the application, the analysis summarizes the academic levels, geographic distribution, gender identities, and racial/ethnic identities of the NREIP applicants. The results show that NREIP gets applications from across the country and from a variety of academic levels. About two thirds of the applicants identified as male, and the racial/ethnic makeup of the applicants was similar to the overall makeup of STEM postsecondary students.

Students interested in participating in the NREIP program submit applications through an online portal that is managed by Saxman One. Those who completed the application shared the following types of information:

- **Basic personal details** such as name, address, and contact info
- **Demographic information** such as race/ethnicity and preferred pronouns
- **Educational background** including current school, GPA, and area of study
- **Employment background** including descriptions of any previous employment
- **Program information** such as which labs the student would like to work at and whether or not they have participated in NREIP before
- **Personal statements** that use an essay format to explain student's career goals, interests, and experience
- **Letters of recommendation** from two recommenders

After applications were submitted in November 2022, selections were made by the NREIP mentors and sites. Offers were sent to selected applicants in early 2023. Multiple sites could send offers to the same applicant.

The sponsor shared a dataset containing a copy of all applications for summer 2023. The dataset contained the information applicants shared, as well as tracking information on who received, accepted, and rejected offers for each NREIP site. These data contain extensive personally identifiable information (PII), and so were handled by IDA with the appropriate considerations, including storing the data only on a firewalled server (for more detail, see Appendix C).

The dataset also includes tracking information on who received offers but did not ultimately participate. These individuals are sorted into one of several options: Declined (they turned down the offer), Withdrawn (they accepted the offer, but then had to withdraw that acceptance), Offer Expired (they did not reply in time), and Rescinded (the offer was taken back by NREIP).

IDA analyzed the application and tracking data to understand the different pools of students who applied to NREIP ("applicants"), who got an offer ("offerees"),[4] and who ultimately agreed to attend ("interns"). The number of students who fall into each of these categories is summarized in Table 4.

[4] For this analysis, applicants who received offers from one or more labs are all considered "offerees."

Table 4. Total Number of Applicants, Offerees (applicants who received offers), and Interns (offerees who accepted offers) for NREIP in FY23, by Academic Level

	Total	Undergraduates	Graduates
Number of Applicants	1,688	1,496	192
Number of Offerees	814	689	125
Number of Interns	581	495	86

IDA first examined what types of academic levels had applied to the 2023 program. Among the 1,688 applicants, 11.4 percent were graduate students, with the remaining 88.6 percent being undergraduates. For the undergraduate applicants, the largest academic level was juniors, who made up 38.0 percent of the total applicant pool. The other levels were smaller, with freshmen being the smallest group at only 11.3 percent of the applicants. This distribution shows that the NREIP applicants span the entire range of eligible academic levels, but are concentrated in the sophomore and junior years of undergraduate school.

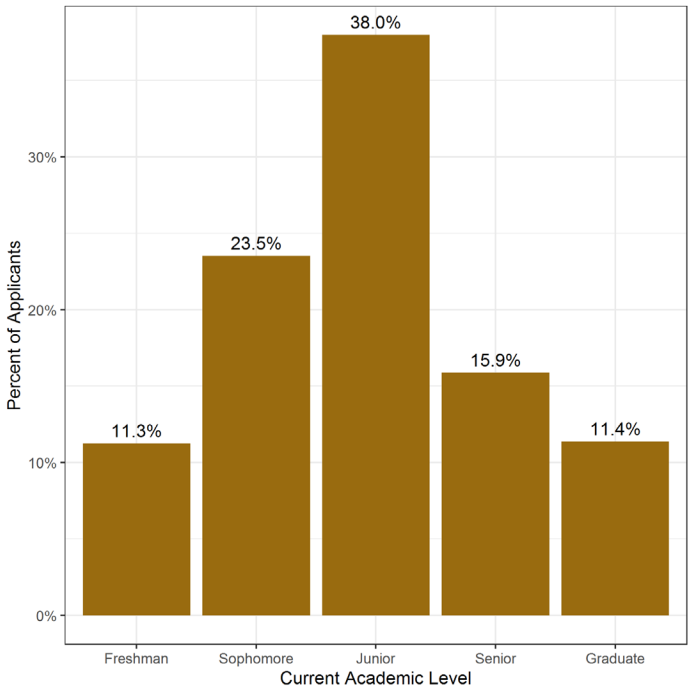

Figure 6. Distribution of current academic level for NREIP applicants.

The NREIP application asked about demographic information. One relevant piece of information is where the applicants live, as NREIP strives to be a national program. As part of the application, all applicants were asked to provide a primary address. All but two applicants gave addresses in the United States. Only four states had no one apply to NREIP

in 2023: Alaska, Arkansas, South Dakota, and Wyoming. Additionally, NREIP had applicants from both Puerto Rico and Guam.

The NREIP application also invited applicants to identify their gender pronouns (Figure 7), races (Table 5), and ethnicities (Table 5). Nearly two-thirds (65.3%) of applicants identified with male pronouns (he/him). Most of the remaining applicants identified with female pronouns (she/her), a group which made up 29.2 percent of the total applicant pool. A very small percentage (0.8%) of all applicants identified with the non-binary pronouns they/them or other unspecified pronouns. Finally, 4.9 percent of the applicants chose not to respond to this question on the application.

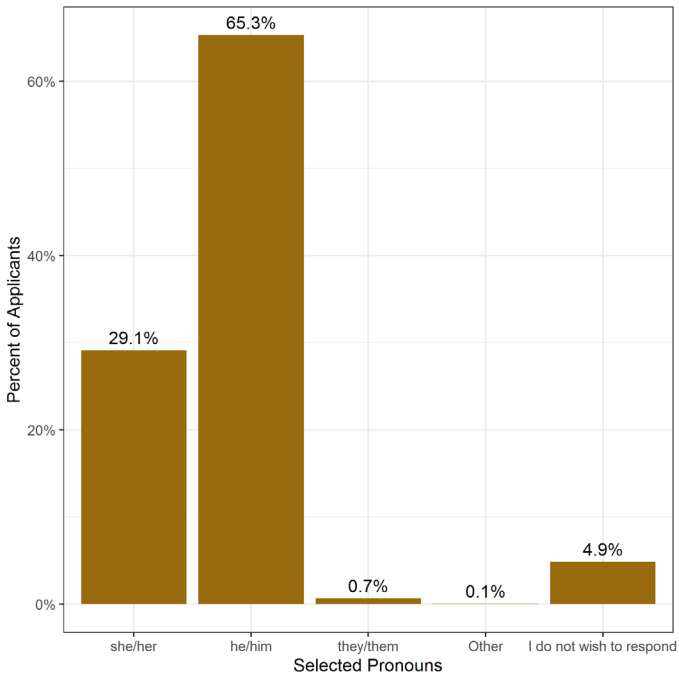

Figure 7. Pronouns selected by NREIP applicants.

The NREIP application allowed applicants to select multiple racial categories. Table 5 summarizes their responses to the questions about racial and ethnic identities. The table also includes two columns that summarize the percentages of each racial or ethnic category in the broader U.S. populations. Both columns include data based on the Integrated Postsecondary Education Data System (IPEDS) surveys, which are nationally representative datasets maintained by the National Center for Educational Statistics (NCES). The first column includes U.S. S&E degree recipients in 2019.[5] The final column

[5] Data summarized from the IPEDS Completions Survey by the National Science Foundation (NSF) (National Science Board 2022), which includes any recipients of associates, bachelors, masters, or doctoral degrees in a S&E field in the U.S. in 2019.

gives the overall postsecondary enrolment in the United States in fall 2021.[6] To make the NREIP application data comparable to these other data sources, any applicant who selected "Hispanic or Latino" are placed in that category no matter which racial identities they selected. Additionally, any applicants who selected more than one racial category (and did not identify as "Hispanic or Latino") were captured in the "Multiracial" category. Note that the data reported by National Science Foundation (NSF) and NCES did not include a category for "Other," while the NREIP application did.

Table 5. Race and Ethnicity Proportions for NREIP Applicants and the Overall U.S. Postsecondary Population

	NREIP Applicants FY23	U.S. Science and Engineering Degree Recipients (2019)[a]	U.S. Postsecondary Enrollees (2021)[b]
White	53.0%	58.2%	53.4%
Hispanic or Latino	16.2%	16.6%	20.6%
Asian	16.0%	11.1%	7.6%
Black or African American	7.4%	9.3%	13.1%
American Indian or Alaska Native	0.1%	0.5%	0.7%
Native Hawaiian or Other Pacific Islander	0.2%	0.2%	0.3%
More than one race	6.8%	4.1%	4.3%
Other	0.5%	N/A	N/A
Chi-square comparison with NREIP applicants	N/A	$\chi 2 = 42$, Degrees of Freedom = 36, $p = 0.2$	$\chi 2 = 42$, Degrees of Freedom = 36, $p = 0.2$

[a] Data based on the IPEDS Completion Survey, a nationally representative dataset produced by NCES. The data reported here was summarized by the NSF to include the full population of people who received associate's, bachelor's, master's, or doctoral degrees in an S&E field in the United States in 2019.

[b] Data based on the IPEDS Fall Enrollment Survey, a nationally representative dataset produced by NCES. It contains information about all students at any level enrolled during fall 2021 in U.S. degree-granting postsecondary institutions.

In order to make the percentages in the table comparable across the categories, the 5.3 percent of NREIP applicants who selected "I do not wish to respond" across race and ethnicity (n = 74) were not included in this table. To understand whether the racial and

[6] Data from the IPEDS Fall Enrolment Survey, as reported by NCES (National Center for Education Statistics 2022) for all enrolled postsecondary students, whether they were pursuing S&E degrees or not.

ethnic composition of the NREIP applicants were statistically comparable to the broader population of U.S. S&E majors and the broader U.S. postsecondary population, IDA conducted a series of chi-squared tests.[7] The results show that the distributions of race/ethnicity are not significantly different between the NREIP applicant pool and the U.S S&E degrees granted (p = 0.2) or the estimated U.S. postsecondary fall enrollment (p = 0.2). In other words, the NREIP applicant pool did not have drastically different racial/ethnic makeup than the broader population of U.S. postsecondary students and STEM graduates.

So, based on these data, NREIP is getting a broad swatch of students across the United States to apply. The applicant set represents a variety of academic levels and has a demographic makeup that is not particularly different than the broader U.S. postsecondary STEM student population.

B. Who Receives NREIP Offers

In the next piece of analysis, IDA examined whether there were any patterns in the types of students who received NREIP offers. Table 4 shows that 814 of the 1,688 applicants got offers, or 48.2 percent of the total applicant pool. One important note is that not all of these applicants got their offers at the same time, as NREIP delivers offers in rounds as offerees decline the initial offers. Since the purpose of the analysis is to understand patterns in who received a 2023 offer at any time, the different rounds of offers will be ignored and all applicants who got 2023 offers will be treated on equal footing.

For this analysis, IDA used mathematical models that are explained in more detail in Section 3.B.1. Ultimately, IDA found several characteristics that were associated with applicants being more or less likely to receive NREIP offers. The factors that were associated with a higher likelihood of receiving an offer were: identifying as female, being an upperclassman (Junior, Senior, or Graduate Student), studying computer science, attending an R1 university, having a high GPA, and being a returning NREIP student. Students who identified as Hispanic/Latino or Black/African American had a lower likelihood of receiving an offer than their White counterparts. However, there are potentially some variables that could not be included in the model that might capture important effects.

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[7] A chi-squared test is a common statistical test that looks at two distributions of numbers across categories and determines whether they are likely to have been drawn from the same underlying distributions. In other words, this test measures whether or not two groups have roughly the same characteristics for a particular variable.

1. Data and Methods

The NREIP application data contains a large volume of information about each applicant, facilitating the use of quantitative methods. More specifically, IDA conducted a multivariate logistic regression analysis using maximum likelihood (Cox 1958). This type of analysis allows researchers to compare the chances of receiving a certain outcome across multiple varying conditions. In this case, the likelihood of receiving an offer was compared between applicants with varying demographic, academic, and professional backgrounds. The approach allowed IDA to identify which factors are significantly associated with higher or lower chances of receiving an NREIP offer.

The first analysis using the application data examined whether the likelihood of receiving an offer significantly varied depending on the following sets of applicant information:

- Demographic information (gender, race/ethnicity, and academic level)
- Academic characteristics (major and school classification)
- Academic performance (as measured by GPA)
- Prior participation in NREIP

In this process, it is impossible to capture all of the possible variation between people, and no realistic model could perfectly predict who did and did not get an offer. Generally, statistical models like these can show important associations between variables, but cannot explain why these associations exist. Throughout the results, the limitations and strengths of the model will be discussed. Full details of the implementation of the regression analysis can be found in Appendix A.

2. Results

The results of the analysis are summarized in Table 6 and Figure 8. The first column of the table gives the different parameters tested in the model. For each categorical parameter, the baseline value is also given. The model results allow us to see how an applicant being in a category other than the baseline impacts whether or not they got an offer. Most of the factors are self-explanatory, and details about them are expanded in Appendix A. One factor that requires explanation is school classification. IDA took the schools listed by each applicant and mapped them to the Carnegie Classification of Institutions of Higher Education (The Carnegie Classification of Institutions of Higher Education n.d.). From there, schools were split into R1 (universities with very high research levels) and not R1, which were the factors used in the regression analysis.

These results are summarized by the second column in the table, which give odds ratios. Odds ratios are estimated differences in the likelihood that someone with a certain characteristic would receive an offer compared to someone in the baseline category. Any

odds ratios over 1.0 means that the factor was associated with a higher likelihood of receiving an NREIP offer, whereas an odds ratio less than 1.0 means that they were less likely to receive an offer. An odds ratio of 1 means that the factor was neither associated with a higher or lower likelihood of receiving an offer. For example, the baseline category for gender was Male, and the odds ratio for Female was found to be 1.28 ($p \leq 0.05$). This means that, holding all other variables constant, an applicant within this dataset who identified as female was 1.28 times more likely to get an offer as an applicant who identified as male.[8]

Table 6 also reports the standard error associated with each odds ratio. The standard error is a measure of how confident one can be in the measurement of the odds ratio, with higher standard error meaning that the value of the odds ratio is measured less precisely. Using these standard errors, it is possible to calculate a significance value, which basically captures how likely it is that the odds ratio is actually different than 1.0. For example, for people identifying as female, the odds ratio was 1.28, the standard error was 0.12, and this translated to a *p*-value, or significance value, of 0.04. In line with current standards in the social sciences, IDA chose a threshold of significance to say that a factor is significant if its *p*-value is less than or equal to 0.05. This roughly means that if the odds ratio for a variable were actually equal to 1.0, the model would give the measured value less than 5 percent of the time in random samples.

Table 6. Summary of Results from Logistic Regression of Which Applicants Received Offers.

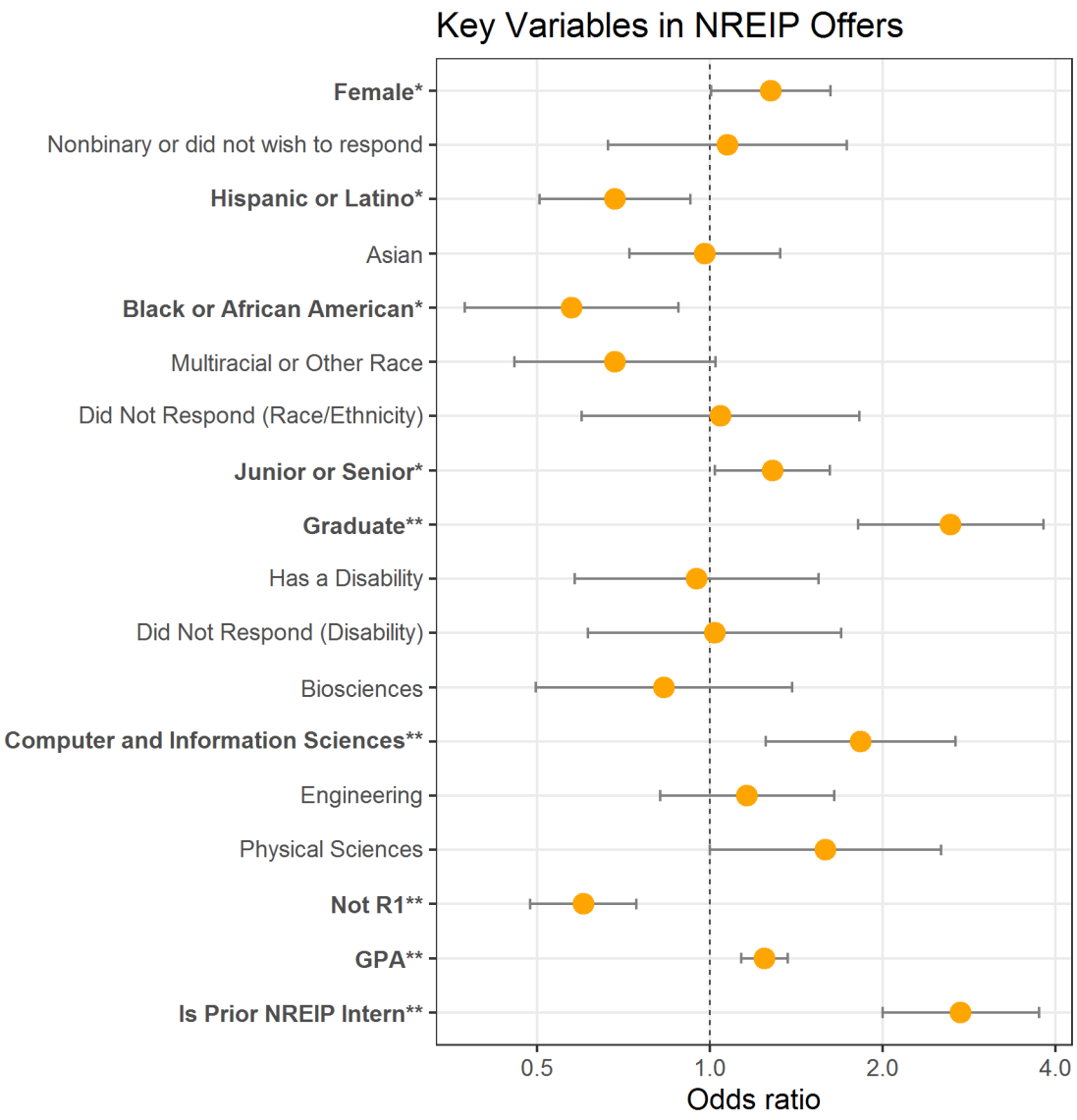
Variable (Reference Group in Parentheses)	Odds Ratio (Standard Errors in Parentheses)
Gender (Male)	
Female	1.28*
	(0.12)
Nonbinary or did not wish to respond	1.07
	(0.24)
Race & Ethnicity (White)	
Hispanic or Latino	0.68*
	(0.15)
Asian	0.98
	(0.15)

[8] The explanation in this paragraph holds for categorical variables. The only continuous variable was GPA, which was coded as a number. For this kind of variable, the odds ratio gives how much an increase of 1.0 in GPA impacts the chances of getting an offer. For example, in this model the odds ratio for GPA is 1.27 ($p \leq 0.01$). So, if there are two applicants and one has a GPA of 4.0 and the other has a GPA of 3.0, but they are otherwise identical, then the model predicts that the offeree with the 4.0 GPA is 1.27 times as likely to get an offer.

Variable (Reference Group in Parentheses)	Odds Ratio (Standard Errors in Parentheses)
Black or African American	0.57*
	(0.22)
Multiracial or Other	0.68
	(0.21)
Did Not Respond	1.04
	(0.28)
Academic Level (Freshmen or Sophomore)	
Junior or Senior	1.29*
	(0.12)
Graduate	2.63**
	(0.19)
Disability (Does Not Have a Disability)	
Has a Disability	0.95
	(0.25)
Did Not Respond	1.02
	(0.26)
Academic Major (Other Majors)	
Biosciences	0.83
	(0.26)
Computer and Information Science	1.83**
	(0.19)
Engineering	1.16
	(0.18)
Physical Sciences	1.59
	(0.24)
School Classification (R1 School)	0.60**
Not R1 School	(0.11)
Academic Performance	
GPA	1.27**
	(0.05)
NREIP Familiarity (No Prior NREIP Experience)	
Has Prior NREIP Experience	2.74**
	(0.16)
(Intercept)	0.33**
	(0.24)
N	*1,650*
Fit Diagnostics	
AUC	0.68
McFadden's R	0.07

Note: Each variable listed except for GPA corresponds to a category that is mapped to a dummy variable to measure the difference between that category and the baseline. For each categorical variable, the baseline is included in parentheses. GPA is treated as a continuous variable, so it does not have a baseline. Significant values are indicated with asterisks (** for $p \leq 0.01$, * for $p \leq 0.05$). N gives the number of applicants included in the regression model. Fit diagnostics are measures of goodness-of-fit for the regression model. More information about these diagnostics is included in Appendix A.

The results are also summarized in Figure 8, where the vertical axis gives the different factors that were tested in the analysis, and the horizontal axis gives the odds ratio. An odds ratio of 1.0 is indicated by a dashed vertical line, and the 95 percent confidence intervals on the odds ratios are indicated with error bars. In other words, if the error bar for a particular factor does not cross the vertical line at 1.0, then that factor is significant at the 0.05 level. The factors that are significant are marked with bold text and asterisks.



Note: Baseline categories were male (gender), white (race/ethnicity), Freshman or Sophomore (academic level), Other Majors (academic major), average GPA, and No Prior NREIP Participation. The error bars show 95% confidence intervals. Variable significance is indicated with bolds text and asterisks: ** ($p \leq 0.01$) and * ($p \leq 0.05$)

Figure 8. Odds ratios for logistic regression on offers.

Before getting into the results, it is important to understand that while this regression can reveal patterns, it cannot reveal all patterns. As shown in Appendix A, IDA undertook statistical fit tests on this model, and they do not explain all of the variation in who gets offers. Simply put, this model cannot perfectly predict whether or not someone got an offer based on just these variables. However, the model is still useful in understanding (a) which variables are statistically associated with changes in the chances of getting an offer, (b) the general nature of the relationship (i.e., more or less likely to get an offer), and (c) the estimated magnitude of the relationship (i.e., how much a given factor increases or decreases the likelihood of getting an offer).

IDA's analysis revealed that a couple of demographic factors are associated with a higher likelihood of getting an offer. Within the gender category, applicants who identify as female were more likely to get an offer than applicants who identify as a male (odds ratio = 1.28, $p \leq 0.05$). There is no obvious explanation for why this is the case.

For the academic levels, the fit indicates that all upper levels (Juniors, Seniors, and Graduate students) are more likely to get offers than Sophomores and Freshmen. For Juniors and Seniors, the odds ratio was 1.29 ($p \leq 0.05$) and for Graduate students, the odds ratio was 2.63 ($p \leq 0.01$). As with most statistical models, there is no way of explaining why any observed differences exist, however, one can speculate. One possibility is that Juniors, Seniors, and Graduate students have had more time to gain experience and become competitive applicants. For example, they are arguably more likely to already have experience contributing to research, which may be valued by the people evaluating applications. Additionally, Freshmen and Sophomores are further removed from decisions about their futures and careers, so may be less likely to enter the defense career pipeline as a result of the internship. So, the people evaluating NREIP applications may have an overall preference for upper grade levels.

Within the model, two categories within the race/ethnicity demographic variable are associated with a lower likelihood of getting an offer. Applicants who identified as Hispanic or Latino were less likely to get offers than their White counterparts (odds ratio = 0.68, $p \leq 0.05$), and applicants who identified as Black or African American were also less likely to get offers than their White counterparts (odds ratio = 0.57, $p \leq 0.05$). There is no clear explanation for why there are differences across races and ethnicities with respect to who receives offers. It is important to note that one limitation of this analysis is that there may be variables missing from the model that could be driving observed differences. One variable to consider for future research would be geographic location of the students.[9] This

[9] Due to limitations in the way applicants' geographic information was collected, the analysis was unable to account for student geography. While applicants reported a full address, the city and street information were not standardized, which meant that location information could be included at only the state level, which is not fine-grained enough to get a good sense of certain geographic properties of the students (for example, whether they were urban or rural). Requesting applicant zip codes in future

geographic piece in particular could be important for understanding the results for race/ethnicity. The data showed that students who identified as Hispanic or Latino were more likely to be from California while also being more likely to list a first-choice lab in California.[10] Since NREIP has more opportunities on the East Coast, it is possible that Hispanic students' prioritization of Californian lab locations may have inadvertently decreased their overall likelihood of receiving an offer from any location. As discussed further in Appendix A, IDA did check whether interactions between race/ethnicity and other variables (such as GPA) could explain any of the variation, but they did not.

The other groups of variables each had factors that were associated with a higher likelihood of getting an offer. Within academic major, Computer and Information Science applicants had a higher chance of getting an offer than applicants who had an "Other" major (odds ratio = 1.83, $p \leq 0.01$). It is possible that such differences reflect the fact that Computer Science majors are in high demand throughout the DoD, including NREIP. Additionally, the model indicated strong differences in the likelihood of receiving an offer between students who attend an R1 school and those who do not. Specifically, students who did not attend an R1 school were less likely to get an offer (odds ratio = 0.60, $p \leq 0.01$). While the school classification is not a perfect measure of school quality, it is often perceived that R1 schools are "better." So, it is possible that the people reviewing applications put priority in extending offers to R1 school attendees.

Similarly, the model indicated strong differences in the likelihood of receiving an offer across applicants with different GPAs. In particular, an increase of one point in GPA corresponded to increasing the likelihood of getting an offer by 1.27 times ($p \leq 0.01$). Once again, one can speculate about the cause of this difference. In particular, as higher GPA is often used as a measure of academic accomplishment, it is possible GPA might be used by people evaluating applications to try to accept the highest achieving students. Finally, applicants who identified as having participated in NREIP before were 2.74 times more likely to get an offer than applicants who did not ($p \leq 0.01$). For this variable, one possibility is that the students who participated before are known quantities who mentors may have wanted back. Conceivably, this familiarity makes these applicants more likely to get offers. An additional factor is that students who did not perform well in NREIP or did not enjoy it are less likely to apply again, so the returning applicants may be stronger applicants overall.

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applications would allow further analysis to examine the impacts of additional features. This type of analysis could help unpack the differences across racial and ethnic groups in the likelihood of receiving an offer.

[10] Applicants could list up to three labs that they would like to apply to, with a first, second, and third choice. They could also select to apply to all labs.

Despite the limitations of the model, the analysis clearly illustrates several patterns with respect to which 2023 applicants received offers. High GPA, prior NREIP experience, majoring in Computer Science, attending an R1 school, and being in a higher grade level all independently increased the likelihood of getting an offer. There were also differences observed across genders and races, though a full understanding of these factors might require including additional factors like geographic factors in the model. It would be worth exploring how such factors may be collected in a systematic manner in future applications to help facilitate further study.

C. Who Ultimately Becomes NREIP Interns

In 2023, of the 814 people who received offers to NREIP, 581 (71.4%) accepted the offer to become interns (Table 4). In this section, we take a closer look at the intern population to examine whether there were any patterns in which offerees (people who received offers) were more likely to accept and become interns. There are several ways in which an offeree might not become an intern: they may decline the offer, the offer may be rescinded, or they may accept the offer and then withdraw at a later time. For this section, because the exact reason why an offeree did not become an intern is unknown, the analysis will examine which variables are important in determining which offerees ended up becoming interns.

The analysis in this section follows similar methods to the offer analysis. Ultimately, there were several categories of students who were less likely to accept NREIP's offer and become interns. These were students who identify as female, students who identify as Hispanic or Latino, upperclassmen (Juniors, Seniors, or Graduate Students), Computer Science majors, students who attend R1 schools, and students with high GPAs. Many of these categories were groups who also were more likely to receive an offer from NREIP.

1. Data and Methods

In order to measure this, IDA used a similar multivariate logistic regression as was used in the offer analysis, as described in Section 3.B.1. Similar to the analysis of offers, the goal of this model is to understand which offeree characteristics are most strongly associated with becoming an NREIP intern. This model also will not be able to capture all possible variation between offerees, and the discussion will include the limitations and strengths of the model. As with all statistical models of this type, this model can only show associations between variables, but will not show why these associations exist.

The only difference between the model looking at participation and the model looking at offers is that they examine different outcome variables. The participation model was used to understand which variables were important in determining which offerees decided to become interns. An important impact of this is that the input data includes only the offerees (i.e., those that received offers), not the full set of applicants. This means that the

number of datapoints in this model is smaller than in the offer case (the number of offerees in this model is 719, while the number of applicants in the offer model was 1,465). Both models use the same independent variables. The full implementation details of this analysis are in Appendix A, while the remainder of this section will focus on the results of the analysis.

2. Results

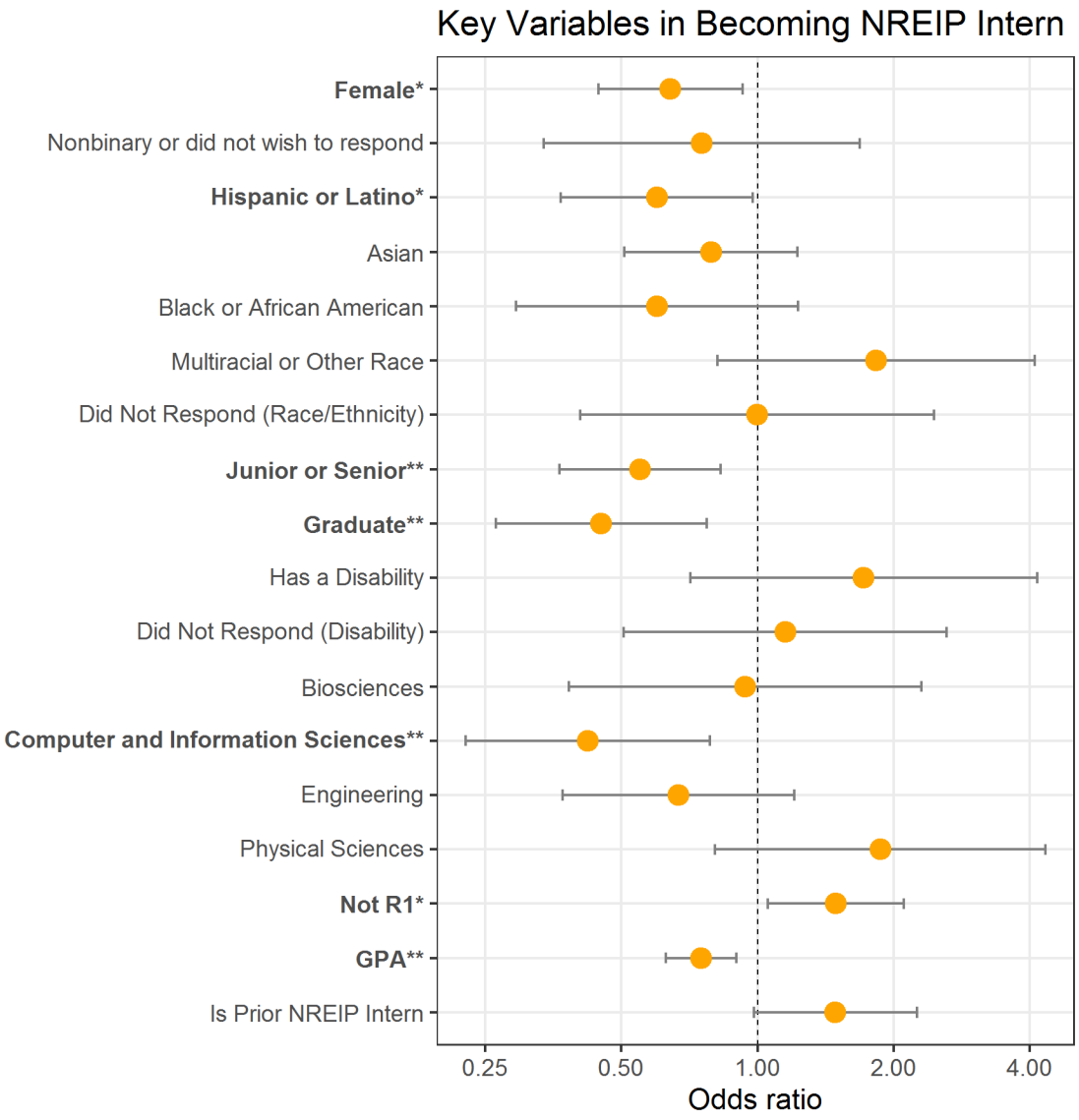
The results of this regression are shown in Table 7, which can be read in the same way as Table 6. The odds ratios for this model are also shown in Figure 9, which can be interpreted in a similar way to Figure 8.

Table 7. Logistic regression of Who Accepted NREIP Offers on Student-Level Characteristics.

Variable (Reference Group in Parentheses)	Odds Ratio (Standard Errors in Parentheses)
Gender (Male)	
Female	0.64*
	(0.19)
Nonbinary or did not wish to respond	0.75
	(0.41)
Race & Ethnicity (White)	
Hispanic or Latino	0.60*
	(0.25)
Asian	0.79
	(0.22)
Black or African American	0.60
	(0.37)
Multiracial or Other	1.83
	(0.41)
Did Not Respond	1.00
	(0.46)
Academic Level (Freshmen or Sophomore)	
Junior or Senior	0.55**
	(0.21)
Graduate	0.45**
	(0.27)
Disability (Does Not Have a Disability)	
Has a Disability	1.72

Variable (Reference Group in Parentheses)	Odds Ratio (Standard Errors in Parentheses)
	(0.45)
Did Not Respond	1.15
	(0.42)
Academic Major (Other Majors)	
Biosciences	0.94
	(0.46)
Computer and Information Science	0.42**
	(0.32)
Engineering	0.67
	(0.30)
Physical Sciences	1.87
	(0.43)
School Classification (R1 School)	
Not R1 School	1.49*
	(0.18)
Academic Performance	
GPA	0.75**
	(0.09)
NREIP Familiarity (No Prior NREIP Experience)	
Has Prior NREIP Experience	1.49
	(0.21)
(Intercept)	15.44**
	(0.46)
N	***793***
Fit Diagnostics	
AUC	0.68
McFadden's R	0.07

Note: Statistically significant values are indicated with asterisks (** for $p \leq 0.01$, * for $p \leq 0.05$). Each variable listed except for GPA corresponds to a category that is mapped to a dummy variable to measure the difference between that category and the baseline. For each categorical variable, the baseline is included in parentheses. GPA is treated as a continuous variable, so it does not have a baseline. N gives the number of offerees included in the regression and the Fit diagnostics are measures of goodness-of-fit. More information about these diagnostics is included in Appendix A.



Note: Baseline categories were male (gender), white (race/ethnicity), Freshman or Sophomore (academic level), Other Majors (academic major), average GPA, and No Prior NREIP Participation. The error bars show 95% confidence intervals. Statistically significant variables are indicated with bold text and asterisks: ** ($p \leq 0.01$) and * ($p \leq 0.05$).

Figure 9. Odds ratios for logistic regression on which offerees became NREIP interns.

As with the previous analysis, IDA undertook statistical tests to understand how well the model fit the data. These are summarized in Appendix A. In the case of the participation analysis, the tests indicate that there is variation in the model that is not accounted for by the independent variables that were included. The model cannot fully predict whether an offeree would become an intern. The analysis still reveals interesting relationships between variables and helps understand (a) which variables are statistically associated with changes in whether or not an offeree participated in NREIP, (b) the general nature of the relationship (i.e., more or less likely to become an intern), and (c) the estimated magnitude of the

relationship (i.e., how much a given factor increases or decreases the likelihood of becoming an intern).

When interpreting the odds ratios, numbers less than one indicate that a particular category had a lower likelihood of participation than the baseline. Looking at the results in Table 7, there are several variables that are associated with lower likelihood of participating in NREIP. For example, offerees who identified as female were less likely to become interns than offerees who identified as male (odds ratio = 0.64, $p \leq 0.05$). The odds ratio of 0.64 means that female offerees were 64 percent as likely as male offerees to accept the offer and attend NREIP. The test cannot explain this difference, but it is interesting that female applicants were also more likely to get an offer. It is possible that this association could be because the female offerees are more likely to get offers from other programs as well. There may be more competition for their participation over the summer.

The other significant demographic variable was identifying as Hispanic or Latino (odds ratio = 0.60, $p \leq 0.05$). This means that offerees who identify as Hispanic or Latino were less likely to become interns than offerees who identified as White, keeping all other variables the same. There is no clear explanation for why this is the case, and further study would need to be done to understand why this group might be choosing other paths.

Additionally, Junior and Senior offerees were less likely to participate than Freshmen and Sophomore offerees (odds ratio = 0.55, $p \leq 0.01$). Graduate student offerees were also less likely to become interns than Freshmen and Sophomore offerees (odds ratio = 0.45, $p \leq 0.01$). While the test does not provide the information to explain why this is, one conjecture is that the upper-level undergraduate and graduate students are more likely to have competing offers from other programs. It is possible that there are more programs that are available to the more advanced offerees. Additionally, if other programs follow the patterns seen in NREIP, the upper-level offerees were more likely to get an offer from each program they applied to, which would mean that they would have more offers to choose between.

Looking at the offerees' majors, Computer and Information Science offerees were less likely to become interns than offerees with a major in the other category (odds ratio = 0.42, $p \leq 0.01$). Once again, one can speculate that this could be related to the fact that Computer and Information Science majors are in high demand. In particular, they are likely to have opportunities in both the public and private sectors, which expands the number of programs competing with NREIP. The results also show that offerees who do not attend an R1 school are more likely to become interns than offerees who do attend an R1 school (odds ratio = 1.49, $p \leq 0.05$). It is possible that students from R1 universities are in high demand as well.

Additionally, offerees with higher GPAs had a lower likelihood of becoming interns. The odds ratio for the GPA factor was 0.75, which means that decreasing GPA by 1.0

increased the likelihood that an offeree would become an intern by about 1.3 times ($p \leq 0.01$). As with the other significant variables in this analysis, there is the possibility that this is tied to increased competition for offerees with higher GPAs. They may simply have more offers to choose between.

NREIP did send a declination survey to offerees who did not accept the offer. This survey could provide some useful information, as it asked why they did not accept the offer and what would have needed to be different for them to accept the offer. Unfortunately, the response rate on this survey was very low, so IDA did not include it in this analysis.

It is interesting to compare this participation analysis with the offer analysis. In particular, five characteristics that were associated with a lower likelihood of becoming an intern (being female, being a Junior or Senior, being a Graduate student, studying Computer and Information Science, and having a high GPA) were all associated with a higher likelihood of receiving an offer in the first place. These results do show that the groups that NREIP is extending offers at higher rates are not participating in NREIP at as high a rate as other groups. While the model cannot measure exactly why these associations exist, the fact that these categories were all associated with a higher likelihood of receiving an offer but a lower likelihood of becoming an intern does support the possible interpretations that these offerees are simply receiving more competing offers. In order to make sure that NREIP is bringing in the groups of people they want, further study would be required to understand what competing pressures may be impacting their decisions to attend NREIP.

Of course, there are possible improvements to this model. As in the offer analysis, one potentially important variable that is known to be missing is the location of the student. In particular, the geographic relationship between the offerees and the labs that accepted them may prove an important explanatory variable as offerees may not want to move far away from where they currently live. As explained in Section 3.B.2, if there is further interest in exploring the potential associations between geographic proximity and participation rates, it could be worth standardizing the application input related to student location.

Taking these analyses together still reveals interesting patterns in who is receiving offers from NREIP, then which offerees are participating in NREIP. Several factors showed an increased likelihood of receiving an offer, but a decreased likelihood of becoming an intern. These factors included: identifying as Female, being a Junior or Senior undergraduate, being a Graduate student, studying Computer and Information Sciences, attending an R1 school, or having a high GPA. Additionally, a factor, prior participation in NREIP, was associated with a higher likelihood of receiving an offer, but no significant difference in becoming an intern. Finally, applicants who identified as Hispanic or Latino or Black or African American were less likely to receive an offer than those who identified as White. Additionally, offerees who identified as Hispanic or Latino were less likely to

become interns. Further models that incorporate factors such as student location could allow for a more complete understanding of the associations between demographic factors and both offer and participation rates.

D. Summary and Recommendations

The data revealed that NREIP receives applications from a diverse set of students across the United States. The NREIP applicants came from 46 different states and 2 territories. Additionally, the racial/ethnic makeup of the applicants did not significantly differ from the estimated racial/ethnic makeup of S&E postsecondary students overall. There were about twice as many male applicants than female applicants.

The first analysis model looked at which demographic and academic factors were associated with the likelihood of receiving an offer from NREIP. Results indicated that applicants who had higher GPAs, had previously participated in NREIP, majored in Computer Science, attended R1 schools, were in higher grade levels, or identified as female were more likely to receive offers. Results also showed that students who identified as Hispanic or Latino or Black/African American were less likely to receive offers.

The next step of the analysis examined which groups were more or less likely to accept an offer from NREIP. Offerees who had higher GPAs, majored in Computer Science, attended R1 schools, or were in higher grade levels, or identified as female were, on average, less likely to accept NREIP offers. Applicants who identified as Hispanic or Latino were also less likely to accept offers. Former NREIP interns were neither more nor less likely to accept 2023 offers, compared to first-time applicants. The type of statistical model used for the analysis cannot reveal the mechanisms behind these patterns. That said, several of the characteristics that were associated with a lower likelihood of accepting offers—having a higher GPA, attending a more selective school, or majoring in computer science—are suggestive of possible competition for upcoming STEM talent.

Another potential limitation to these analyses is that there may be unobserved factors that could be influencing the results in ways that cannot be captured by the model; for example, how close an applicant lives to an NREIP site. Below, IDA offers recommendations on how to gather some of these potential hidden factors going forward using the application form.

1. **Get applicant zip code**. While the applicants provided addresses, they did not have to provide a zip code. Written addresses are less robust than numerical zip codes. Having zip codes corresponding to where the applicant resides for most of the year leading up to the summer that they are applying for would allow for further analysis of the distance that interns are traveling from their primary address to participate in NREIP.

2. **Use a numerical GPA input**. Applicants were allowed to enter whatever text they wanted in the GPA field. Using a purely numerical field with guidelines for how to normalize GPAs would give a more consistent measure across students.
3. **Use a standard set of schools**. Currently, the applicant's school name is a free text entry. Students who attend the same school may enter the name in a variety of different ways. In order to standardize, use a standard set of schools for the applicants to pick from. Due to the large number of schools, it would be ideal to let the student start typing their school and use that information to narrow down the list they can select from. Of course, not every school could be included, so there would have to still be an option for free text entry if their school is not one of the available ones. This would allow for quicker analysis of what types of schools the applicants and interns are typically coming from.
4. **Clearly report which labs extended offers to each student.** A single applicant may get offers from multiple labs across different rounds of offers. In the application data, this information is not reported consistently from applicant to applicant. So, there is no way to clearly say which labs extended offers to which applicants. Adding a set of columns that captures exactly that information consistently across labs and applicants would allow for deeper analysis of which applicants are getting offers from which labs. For example, for each applicant, there could be a set of columns corresponding to which round that lab offered the applicant an offer in.
5. **Consider introducing an incentive to encourage more applicants to take NREIP's declination survey**. For the FY23 NREIP cycle, there was a declination survey that asked why offerees did not accept the NREIP offer. Unfortunately, this survey had a fairly low response rate. While it is difficult to increase survey response rates, particularly for students who are no longer affiliated with or applying to the program, IDA recommends introducing some type of incentive (e.g., a raffle) to see whether it helps increase the response rate going forward.

4. What Interns Gain from NREIP

To understand what interns gain from NREIP, IDA interviewed 37 interns from the 2023 cohort to document their first-hand perspectives and reported experiences. Due to the possibility that NREIP experiences may vary depending upon program size, the sample was constructed in a way to ensure representation from both large (more than seven interns) and small (seven or fewer interns) sites (for more detail, see Appendix A). IDA's sampling frame also took academic level into consideration to ensure a more balanced mix of both undergraduate and graduate students, since undergraduate students overwhelmingly dominate the full NREIP population. After drawing the sample, IDA verified that the distributions across race, gender, major, and Naval organization were proportionately comparable to the full population of 2023 interns.

The resulting sample included interns from 22 (out of 45) sites. Sixty percent of the sample were from large sites (hosting eight or more interns), while 40 percent of the sample were at small sites (hosting seven or fewer interns). Slightly more than half (57%) of the sample identified as "male," a little more than a third identified as "female" (38%), and a few (5%) identified as "non-binary." Close to three-quarters (73%) of the sample identified their race as "White," 8 percent identified "Asian," 3 percent identified as "Black or African American," 3 percent identified as "Hispanic or Latino," and 11 percent identified as "more than one race." One person's race/ethnicity is unknown, since the interviewer was unable to ask the question due to time constraints.

IDA developed a set of interview questions that invited interns to discuss various aspects of the NREIP experience, from finding housing and completing research to building relationships with their mentors and fellow interns. IDA also asked interns to discuss and rank what they gained from NREIP. Participation in the interview was voluntary, as were all questions, to protect interns' agency over the flow of information. IDA also took extensive measures to protect interns' confidentiality (see Appendix C). As such, any intern names found in this document should be considered pseudonyms.

A. Ranking Impact Areas

As a conversation starter, IDA asked respondents (Rs) to rank the following areas in terms of where they felt they gained the most (Ranked first) to the least (Ranked third) from NREIP: STEM/Technical Development; General Professional Development (e.g., knowing what you want to do for a career, resume building, and soft skills like the ability

to work on a team, deliver briefings, and so forth); and Enhancing your Professional and Social Networks. Results are illustrated in Table 8.

Table 8. How Interns Ranked their Gains from NREIP (n=37)

	STEM / Technical Development	General Professional Development	Enhancing Professional & Social Networks
% Ranked 1st (Most gains)	43%	30%	27%
% Ranked 2nd	38%	49%	14%
% Ranked 3rd	19%	22%	59%

Rs ranked STEM/Technical Development in first place more often than the other two areas. Looking at the percent of the sample ranking each area first place, 43 percent pointed to STEM/Technical Development, 30 percent pointed to General Professional Development, and the remaining 27 percent said that they made the most gains in their Professional and Social Networks. STEM/Technical Development also placed second for a substantial number of Rs (38%).

General Professional Development was next in the rankings, with 30 percent of the sample saying they made the most gains in it and 49 percent saying that they made the second-most gains in it. The remaining 22 percent said they made the least amount of gains in General Professional Development, comparatively speaking.

Enhancing Professional and Social Networks closely followed General Professional Development in the rankings. Twenty-seven percent of the sample said that they gained the most in their networks, 14 percent placed it second, and 59 percent placed it third. It is worth noting how the percentages are greater in first and third place, compared to second place. As discussed in the upcoming section on Professional and Social Networks, interns varied significantly with respect to the number of networking opportunities that were available at a given site. Consequently, the ability to make networking gains was dependent on opportunity—those at sites that prioritized networking reported strong gains, whereas those who were not tended to rank Professional and Social Networks third.

After inviting Rs to rank the three areas, IDA followed up with questions about how NREIP helped them make gains in their top-ranked area, what they would have wanted to be better for their lowest-ranked area, and how either of the above could be improved for future cohorts. The remainder of this chapter organizes their remarks by the three impact areas to discuss the specific kinds of gains interns described making, what they thought helped facilitate these gains, and any challenges they may have encountered along the way.

Where appropriate, direct quotes from interns are included to help illuminate analytic findings.

B. STEM/Technical Development

Rs often talked about how the program impacted their STEM knowledge and technical skills. In this section, we introduce the types of STEM knowledge and technical skills that Rs attributed to NREIP. We then discuss Rs' perceptions about what helped facilitate these changes, as well as any challenges that may have hindered their ability to achieve their desired STEM gains.

Rs talked about how they were able to refine their current technical skills, expand their knowledge of new technical areas, and gain familiarity with the research and development process. These gains were often facilitated by interactions with mentors and other STEM professionals. A few Rs talked about challenges with a mismatch between what skills they hoped to use in the program and what was expected of them.

1. Impacts

Almost half (43%) of Rs ranked STEM/Technical development as the area where they made the most gains. The interview analysis revealed three ways in which interns felt that NREIP impacted their STEM skills and technical development: (1) providing an opportunity to apply and refine their current technical skills, (2) expanding their knowledge of new technical subject areas, and (3) familiarizing them with the research and development process.

NREIP gave interns an opportunity to apply their academic expertise to hands-on problems, refining those skills in the process. The NREIP application process includes information about what the applicant already knows, so interns could be matched with projects that allowed them to use what they knew from other work or courses. About half (19) of the interns interviewed touched on how their expertise aligned with their NREIP internship. Most of these interns emphasized how it was useful to be able to apply their academic knowledge to a hands-on setting. One R talked about how this was her first opportunity to apply their specific knowledge.

> *I definitely gained more experience in applying my expertise in [Subject Area] [11] in the realm of the Navy. I had never done that before. So, to kind of understand its impact was really great.*

This intern valued being able to see her expertise have a real-world impact. Being able to connect her classroom knowledge to actual applications was seen as a strength of the program, as it would not be possible to get that kind of experience in the classroom.

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[11] Information in brackets has been omitted to protect the identity of the interviewee.

The emphasis on application also helped interns refine their current skills. Several Rs talked about refining their coding or data analysis skills. One intern appreciated the opportunity to improve coding skills to a higher level of technical precision, and talked about being able to grow rudimentary C++ (a programming language) skills to the next level. These students are gaining hands-on experience in NREIP, which naturally pushes their abilities even in areas that they already have some knowledge. Several of the Rs talked about coming out of NREIP with stronger skills and being able to apply those when they moved on to their next educational or professional activities. Basically, an internship like NREIP can speed up how quickly students grow certain skills as they need to learn quickly to apply those skills to real problems. Ultimately, these students believed that they came out of the program with an advantage over others, as NREIP helped them gain the ability to use STEM knowledge rather than just understand it abstractly.

The next gain that came up in the interview analysis was expansion into new technical areas. A majority of the Rs (22) described gaining knowledge in subjects that they did not have prior experience with or new skills that could help them going forward. One intern touched on how they were able to gain experience in new areas as well as some new skills.

> *Like [Discipline A] is not something I'm familiar with because I'm a [Discipline B]… And this [summer] I worked on multiple different tasks that were more [Discipline A] related. And even some had [Technical Skill] in it, which was kind of cool to try. So, I would have to say I've gotten more confident in my own skills because I've learned a wider range of things, and I feel like I can apply that better in future endeavors.*

This R saw a lot of benefit from the fact that the lab she worked in did not solely rely upon her current expertise. Rather, she was able to learn a new subject area and try a new technical skill. Perhaps most importantly, this broadening experience helped build confidence in her overall skillset by demonstrating her ability to learn.

Importantly, these skills have benefit beyond just the NREIP program. For all of these interns who were able to gain new skills, they can take those skills forward to either school or future research. A few Rs specifically used the word “tool box” when talking about these skills, and focused on how they were able to add more tools to their repertoire. A particular focus area was coding skills, with several Rs talking about how they learned new languages or new libraries that would be helpful for future work. Additionally, these tools make the interns more hirable in the future, and will help make stronger STEM professionals going forward. NREIP was crucial for giving these interns the tools they need for future success.

The third perceived technical gain that Rs touched on was learning about the research and development process. This area refers to how interns learned about the different aspects of doing research in the federal government. About half (19) of the Rs discussed learning about the research process. Amongst those, one refrain was learning how to think about

and approach more complex problems than they would see in their school work. For example:

> *So, what I've learned from my mentor is…any topic that you're dealing with, it's important to start from the fundamentals and then build up almost like in Jenga… It's important to have a strong foundation. So, when you're building up, your foundation is not going to slip under. And you're gonna be able to sustain higher concepts… Like step one -- you have to understand step one before you could understand step two before you could understand step four or five. And if you understand, step one and two, you're going to understand step four and five a lot better.*

This R feels that NREIP helped her better understand how the various aspects of the research process fit together, starting with the fundamentals and building towards actual research. For interns who have not had this type of experience outside of the classroom, this lesson can be crucial. A better foundation allows interns to approach unfamiliar topics in a systematic way and not get lost in their complexity.

Rs also touched on specific pieces of the research process that they gained experience with in NREIP, including literature reviews, data collection, and communicating results. The communication piece was particularly important, with quite a few Rs talking about publications or presentations at the end of the summer. One R emphasized the importance of the publication.

> *Some of the work that we did this summer, we intend on publishing it, which is very cool. Because… if I can get a publication out of a 10-week internship, that's always great. Especially because grad students, a lot of the emphasis is on getting, you know, publications and stuff for their CVs. So, I think that's gonna be very important for me, kind of going forward.*

This R is pleased that he is getting a publication out of a relatively short internship. Interns who get publications gain scientific communication skills, but they are also gaining useful lines for their CVs going forward. As this R is discussing, being able to point to a publication is a strong selling point for young researchers. So, publications allow interns to see gains not only in learning the research and development process, but also in demonstrating those gains to potential future opportunities.

2. Facilitators

The Rs also touched on how they arrived at these different STEM and technical gains. A significant portion of the gains were attributed to reading background literature, for example. However, they attributed most of their gains to interacting with STEM professionals at NREIP. Whether mentors or other people in the same lab, interns learned a lot from the people working around them. Just under half (16) of the Rs brought up how other STEM professionals contributed to their respective technical gains. Quite a few of these Rs talked specifically about the mentor as a key resource.

Since NREIP required significant amounts of technical work from the interns, mentors were a crucial technical resource. Rs talked about mentors helping in a few different capacities. Mentors offered a valuable perspective as already established S&E professionals, some being well-known leaders in their field. Many Rs expressed appreciation for getting the chance to work elbow-to-elbow with such professionals. In addition to drawing upon the mentors' subject-matter expertise, interns recounted being advised on specific techniques, equipment, alternative approaches to problems, and applications to other areas. Working with the mentors and getting to see their projects also meant that interns became acquainted with real-world technologies and Navy interests. All of these interactions discussed by the Rs are examples of NREIP meeting its goal to enhance education with mentoring by laboratory scientists and engineers.

Rs also talked about how mentors played a role in helping them achieve growth in technical areas. For one intern, looking to both apply their current skills and expand their skillset, the mentorship relationship helped facilitate the growth that they were seeking.

> *It is a push of my skill set. I've definitely learned a lot of new coding techniques this summer. I've done research on things that I didn't understand. I took a lot more lead this summer… rather than being told what to do. I was told to figure it out, which I think comes with my skill set. So, I've got a better skill set as I've increased my education. And so, she's giving me something that matches my skill set.*

In this response we hear the mentor structuring the work such that the difficulty of tasks and level of guidance were tailored to the intern's development. Consequently, the NREIP experience helped the R add to their toolbox of skills while also gaining greater confidence in STEM.

To further reinforce the importance of mentors, Rs also attributed a lack of gains to their interactions with mentors. For example, one R talked about how her mentor's less guided approach proved unhelpful and disheartening. She became acutely aware of the lack of STEM growth after being asked to teach a high school intern how to handle particular lab procedures. For this R, the vague or missing direction from the mentor on the initial procedures, along with the expectation to familiarize another intern with the same steps, left her with a feeling of "the blind leading the blind." It is important to note that in this case, the R was a returning NREIP intern who did not get to work with their mentor from the previous summer.

Other Rs discussed how the entire community of professionals at NREIP helped facilitate their STEM gains. One R talked about how their lab had people with a wide variety of expertise, which allowed them to grow in areas that were less familiar. Other Rs similarly described how their NREIP collaborations facilitated learning that would be helpful in their future pursuits.

Other Rs talked about how the relationships they developed with people from the lab helped inspire next steps. For example, one intern reported,

> *They are hiring me on as a contractor this fall such that I can continue working with them… for six months starting January 1. So, totally is impacting my life, totally is impacting the direction of my PhD dissertation as well. Since I am able to establish this kind of long, I guess you could say internship, but more of a professional relationship with the team on a longer project as well, that's been really great.*

Building upon her positive experience with the team at the lab, the R is able to continue her work with the DoN by being hired as a contractor after the internship. Other Rs likewise described how the positive relationships that they had built at NREIP inspired them to prologue the engagement, albeit by extending their internship periods.

Finally, some Rs discussed benefits generated from interacting with other interns. For the most part, interns did not collaborate with each other on research because they were typically assigned to separate projects. However, a handful of Rs were able to engage other interns in ways that helped their STEM growth. In some cases, the growth emerged from simply discussing projects together, since sharing allowed interns to learn about less familiar topic areas. In a couple of cases, Rs worked with other interns to problem solve research-related challenges. All in all, while few Rs indicated that other interns helped facilitate their STEM / technical gains, those who did reported benefiting greatly.

3. Challenges

IDA's interview analysis also revealed a few challenges that interns felt made it more difficult to achieve the STEM and technical gains that they had wanted. For example, a few Rs thought that their internships did not provide a good outlet for applying their skills. In particular, they felt that the match between themselves and the lab where they were placed was not great. One student who focused on computer science felt this particularly strongly.

> *I think it was mostly just kind of where I was placed… The main focus isn't on STEM. It's more on communication and battle readiness... And in that sense, there isn't a lot of programming or mathematics or anything that involved, too much. It is computer science related in the fact that there's scripting and stuff like that. But it's not the general sense of programming like software engineering type stuff.*

This student was not able to use their programming and math skills in the way they wanted because the lab they were assigned to focused on other areas. So, while the R could work on rudimentary scripting, the internship did not provide a way to further develop or apply their technical skillset. A few other Rs likewise commented on how a mismatch could be detrimental. Similarly, these students were not able to grow in the ways they wanted

because they had to instead focus on other topic areas. Making sure that the work an intern will be doing matches their interest would go a long way in alleviating this challenge.

For other Rs, the mismatch meant that they could not gain the new skills that they wanted. One intern came in with the necessary expertise already, so felt that they could not grow in new directions. A couple of Rs felt that the work they were being asked to do did not line up with the areas they were hoping to grow. For example, one R wanted to gain more experience with lab work, but was tasked primarily with background research during their program. While these views did not reflect many Rs, for the people who were impacted, the mismatch between what the lab wanted interns to do and what the interns hoped to gain had an outsized impact. Some interns wanted to use their current skills to help the lab immediately. Other interns wanted the opportunity to learn and grow in new areas. Working to understand what the interns want and what the labs need before matching interns to labs could help in making sure that both sides get the benefits they want out of the program.

The second type of challenge that interns raised was a lack of information or other resources needed to complete their work. For a couple of interns, this meant a lack of communication before their program started. They felt like they did not receive the necessary information about what they would be working on to come in prepared. One R even suggested that NREIP could provide a syllabus of useful prerequisites for their research before the program actually started. Essentially, this intern and a few others felt like they came in unprepared, and that NREIP or their mentors did not do enough before the program to help alleviate that. Other Rs also felt like there was not enough training or communication during the program to help them get up to speed on research areas that they were not familiar with. One R talked about how they were put on a project that required a lot of background that they did not have the time or resources to understand during the short internship period. Another talked about how there was not training on the correct way to read papers for research, which was an essential piece of the research and development process. Additionally, a couple of Rs talked about how the appropriate training was not available in the new skills they were hoping to learn in the lab. In general, all of these interns would have benefited from more training in the backgrounds of their specific projects, general research methods, or specific skills in which they were hoping to grow.

The third type of challenge that interns raised was bureaucratic hurdles. One R mentioned that it was difficult for them to get approval to travel for data collection. Another discussed difficulty in accessing articles for literature review because they did not have official status with the library at the lab. Ultimately, this student had to find a work around and get the necessary articles from their university, a strategy that may not be available to all of the interns. These challenges taught the interns about the process of working within the federal government, but their experience would have been smoother if NREIP seamlessly integrated the interns into the workforce. From these few Rs, it seems that there

are simply some resources that are not available to interns even though the rest of the lab has access.

While mentors were generally seen as helpful facilitators of STEM gains, some Rs had difficulties with their mentors that hindered their technical gains. A few interns mentioned that their respective mentors were busy or on vacation for several weeks during their internship. In these cases, the interns felt that they could not always get their technical questions answered in a timely fashion. One R talked about how during the first few weeks of their internship they were unable to do any meaningful work because their mentor was away. Additionally, one intern (discussed in Section 4.B.2) felt that even when their mentor was present, the mentor did not provide useful guidance. In order to help the interns maximize their STEM gains, it is important that the mentors be present, available, and willing to help.

4. Summary and Recommendations

Overall, Rs grew in their abilities to apply their current skills, their knowledge of new subject areas and skills, and their understanding of the research and development process. A significant amount of these gains came from working with mentors and other STEM professionals. The interns' new knowledge and connections were likely to help them going forward as they move to other opportunities. Some interns had challenges in realizing these gains, which were often due to a mismatch between the work they were assigned and what they were hoping to gain from the program. Working to ensure that the interns' goals are clear before the program could help mitigate this.

To ensure that interns can maximize their gains in STEM and technical areas, it would be good to make sure that intern goals match lab goals. In particular, this means ensuring that interns who want to refine their current skills are matched with labs that need those skills and interns that want to learn new areas have the opportunity to move beyond their current knowledge. Another way to help the interns is by easing some bureaucratic burdens and ensuring that the interns have access to the full resources of the labs where they are working.

C. General Professional Development

Participating in NREIP offers an opportunity to realize gains in non-technical, professional development areas. In this section, we discuss the professional development gains discussed by Rs in relation to NREIP. The remainder of the section is dedicated to how these gains were facilitated and challenges that Rs faced in realizing professional development gains.

1. Impacts

Out of the 37 Rs, 11 individuals ranked professional development as the top area in which they received gains. The different areas of professional development gains that interns touched on were (1) learning how to operate successfully in a work environment, (2) informing future career goals, and (3) improvements in generally applicable soft skills.

NREIP often acted as an introduction to professional environments, providing interns useful insight on how to be successful. Of the 37 Rs, 21 indicated that NREIP was their first internship experience. This included all 11 of the Rs who ranked professional development as their top area of gains. Rs described learning how to conduct themselves professionally, how to navigate tactfully around others in a work setting, and how to interact with coworkers in an appropriate and effective manner. One R described what this gain looked like,

> *And one thing I really learned, it was kind of learning that I could do it, you know? Or that in an environment like this, something that's easy to do and good to do is just sort of going around and talking with people and like seeking out experts about certain problems. Because it was really, you know, a lot of these things that I ran into, I was having problems with, I wanted to learn more about was, you know, it was pretty much just a, um, email address away where I just had to find the person to ask, you know, sort of learning how to do that. Learning how to reach out to people, you know, just set up a meeting and sit down and ask the right questions and things like that. I personally think is, you know, it is gonna be extremely useful and applicable to what I'm gonna continue to do, you know, because even at a at a university, it's pretty much the same thing.*

The intern in this case learned about drawing upon the resources of their colleagues within the office, including reaching out to the people who would be most helpful and understanding how to ask the right questions, and therefore most effectively leveraging their expertise. Learning how to ask for help is an important aspect of being successful in a professional setting. This may be especially true for STEM-based projects where solutions require one to think about problems from various approaches. As a result of the NREIP experience, interns gained the skills necessary for collaborative work environments.

NREIP also exposed interns to how non-academic lab settings operate. Most Rs depicted the experience as their first time operating in a research environment outside of academia. In these cases, their professional development included learning about the differences that arise while functioning in non-academic labs. When speaking to these differences, one R remarked:

> *I think I have never worked in a facility like that before. And there were several things that were different, like -- some of the tasks that I had to do or some of the rules or obligations that I had to follow was completely*

different than working in a restaurant or doing some other type of job that most people do.

The R here learned about the day-to-day operations within this lab and contrasts this type of work environment with other types of jobs. The comparison being evoked in this case is an important clue to the value of their NREIP experience. Time spent in the lab during the internship provides a benefit that other work experiences may not. Interns learn proper procedures for working in a research setting outside of academia, and will be more comfortable in those settings going forward.

The second gain that interns discussed was future goal setting. When asked to reflect on how participation in NREIP may impact their future, Rs tended to point to the insight they received on the types of opportunities that are out there, as well as NREIP helping them refine their interests. About two-thirds of interns talked about how their experience will shape the career and academic goals they choose to pursue. Regarding their more immediate futures, Rs learned about follow-on program opportunities as a result of their time in NREIP. About 16 percent of Rs stated plans to apply to another government internship, such as the Oak Ridge Institute for Science and Education, the STEM Student Employment Program, the Science, Mathematics, and Research for Transformation program, and so forth.

Regarding more distal futures, some Rs talked about NREIP providing a vision of what the application of their field of study looks like and helping them discover the range of what is possible. As an undergraduate, a student's major can be broad enough that the question of "what do you want to do" seems inscrutable. But Rs talked about being exposed to different job positions or niche areas of study through NREIP, such as one R learning that the Navy hires astronomers. Other Rs already had an idea of what is out there, and so instead talked about their time in the program as a way to see the day-to-day reality of certain career paths. These insights helped them resolve uncertainties about something they were already considering, such as working for the Navy or pursuing a Ph.D. About one-fifth of the Rs mentioned considering a career working for the Navy or DoD more generally. One R, who was interning with NREIP after their freshman year of college, said:

I got kind of thrown into this project that I had no knowledge of, and I didn't know what it was. And I ended up not being the lead, but very much leading this project in a form. And I decided that I really love this work. This was super interesting to me. And that I was absolutely --didn't want to do-- didn't even really want to do the work that I came here to do. That bored me. And now this is piquing my interest. And I could see myself doing this for a super long time. It doesn't feel like work. And a lot of people say you'll never work a day in your life if you really love your job that much. So I just couldn't stop like getting articles, research articles, looking into what this was. Because I was so interested in this new topic. and I think NREIP really, really brought me to understand what I really want to do, besides what I

> *don't want to do. because I am, my like-- my field of study is very broad, and people always ask what you want to do. And I'm like, I don't really know. And now that I'm here and I have done this, I'm like, this is exactly what I wanna do. I can specialize in this.*

The R sharing this excerpt had some idea about what they were interested in when beginning the program, but in this case participating in the work revealed that the original topic was actually not right for them and it was a new topic that sparked their passion. In general, interns in NREIP can be exposed to new topics and types of work that can give them insight into what they want to do. For this intern and others, this may mean finding a new area they love. For others, it means reinforcing an area they were already interested in. Importantly, the fact that NREIP provides realistic work experience gives the interns a better gauge on what they want to do in the future.

NREIP also gave interns valuable insight into whether they wanted to go into government service. For the majority of Rs, this was their first experience in the government, which means that it is a crucial first impression that can inform whether they consider it to be a viable option in the future. The following R described how they benefited from NREIP in this way.

> *Yeah, I really learned a lot about working for the government and, you know, particularly the [Site Name]. I had no prior experience working in a government capacity. So I feel like I learned a lot about, like, hiring process and, like, how promotions are scheduled and how the interactions are handled and kind of where you sit within the government and how funding works as an independent -- well, not independent, but as a research agency within the government. Um, so that was really beneficial, because I think that overall helps my professional development in the long term and will help me decide what career path to take.*

Given that most people are not familiar with how the government operates, this inside look at the processes and procedures granted valuable insight into whether government service fit with their career goals. In general, growing a sustainable government research workforce is benefited by making sure that the right people join that work force. By giving potential applicants a taste of what working in the government is like, it helps ensure that the people applying for government jobs already have familiarity with the system and are coming in with some idea of whether it is something they want to pursue long term. While some Rs expressed an interest in applying for a career in government, a few others learned that the fit was not right for them.

Alongside the insight about what they do or do not want to pursue in the future, Rs pointed to the more tangible benefits of becoming better quality candidates for those opportunities. Interns seemed well aware of how their time in NREIP would reflect on their resumes and how this may position them for later success. One R highlights these benefits below.

> *I think it will definitely impact my job - the job opportunities that I have out there. And having, you know, something that was a little more diverse than my graduate school, and something that was also being able to work on something that's very important for the progress of the field of [discipline]. And so, I think the biggest impact it might have is the job opportunities that are out there.*

In addition to being an additional line on their CV, having professional research experience on top of their academic work helped the R diversify their background and become more competitive in their field.

The final professional development gain discussed by Rs was the cultivation of non-cognitive or "soft" skills that could be applied toward almost any work environment. The two main soft skills that came up were working effectively on teams and public speaking. Public speaking was a particular emphasis, as some interns remarked on opportunities to deliver briefings and saw an improvement in their comfortability and proficiency over the course of the program. For one R, the gains in this area were clearly demonstrated when comparing their time in NREIP this summer with their experience the previous summer.

> *I was able to improve my ability to, um provide briefings, so this is kind of that second category, um, the professional development. So last summer, last year, I was giving a briefing to those ONR sponsors at the end of the summer, for the work that we did, I would get really nervous. Um, just because it was my first-time kind of giving, uh, a large presentation in front of people that had a lot of influence. But this summer, I kind of, I would say, matured a little bit in that area, and I was able to kind of hold myself more confidently. As well as, I think, have a better presentation, um, organizing my ideas and in a slide format, and providing the information that people need to see.*

Not only did this intern feel more comfortable with the experience of briefing an audience that included leadership, they also became a more effective communicator of STEM ideas. Typically, improvements in these areas of professional development were more evident to interns towards the end of their time in the program, as a requirement of NREIP is to deliver a final presentation on their research work over the summer. However, because of that requirement, all NREIP interns will gain at least some experience with presenting even if they did not bring it up in their interviews.

2. Facilitators

When describing their professional development gains, Rs cited a few facilitators: exposure to a professional environment; the people that they worked with; and organized events.

There was something to be said about the sheer exposure to professional environments that prompted significant learning about how things operate, what types of

work is out there, and whether the day-to-day reality matches what interns were seeking. Interns also pointed to the people they worked with as key facilitators. Mentors, team-members, and other professionals that interns met over the course of the program served as models in a few ways. Hearing about their different backgrounds, career paths, and research portfolios allowed interns to see the realm of what is out there, along with how the different paths of how to get there. Furthermore, observing how these professionals interacted helped shape interns' understanding of conduct and relationships in the workplace. These opportunities for learning occur naturally when working side-by-side with team-members. One R was at a site that offered trainings, but said, "You know, even though we had our [training] presentations, I still got more of seeing these guys every day and learning from these guys." For this R, the real gain came from working with the other professionals in their lab, rather than specific trainings that the lab offered. This reflects the importance of NREIP as an experience. The interns are simply able to gain more insight into the details of working from the people who are actually doing the job than from any number of trainings. While at the discretion of their mentors, some Rs described taking the lead on team meetings and growing from this opportunity. A few others mentioned being brought along to meetings outside of their team, which granted the chance to encounter professionals working in other parts of the organization.

A final facilitator of professional development gains was organized events such as trainings, seminars, or tours. A few Rs remarked on the usefulness of topics like public speaking, careers in STEM, and how to evaluate research papers. More common were references to organized tours. Approximately one-quarter of Rs recounted experiences with seeing other parts of their site or trips off-site. Along with networking events, these types of events granted the chance to see what else and who else is involved in the goings on with Naval STEM. In this way, NREIP offers a benefit that other internships may not—if the opportunities and resources are made available, such as with these tours and trips, an intern can be brought more fully into the Navy or DoD ecosystem and thus be connected with a host of trajectories beyond the one position they may have originally filled.

3. Challenges

About one-fifth (22%) of Rs ranked general professional development as the area where they received the least amount of gains. Many of these individuals explained their gaps by pointing to a lack of opportunities. This was in part due to their sites not offering organized events, such as tours, networking functions, or trainings. A few Rs commented that while their sites did offer things like tours, there simply were not enough slots for everyone to participate. Issues with professional development were also attributed to mentors. Some Rs felt that their mentors were not active enough about creating opportunities to introduce them to other STEM professionals around the site or about giving occasions to deliver briefings or take the lead on tasks.

4. Recommendations

NREIP interns grow in various ways by spending time in a professional research setting. Their growth is enabled by a combination of exposure to the working environment, interactions with colleagues and mentors, and organized events such as networking meet-ups, facility tours, training sessions, and seminars. For Rs who did not gain as much in the realm of professional development, the differentiating factor seemed to be a lack of opportunities at their respective sites. Having less exposure to other departments, projects, or colleagues meant that an intern did not get as much of a chance to understand the breadth of what goes on in Naval STEM, and thus less of a chance to learn whether such a career is right for them.

To better enable gains in the area of professional development, steps could be taken to ensure that NREIP interns across the range of sites have more consistent opportunities to engage with different research topics, colleagues, and events, as these emerged as the facilitators for gains. Increasing access to facility tours, either by making them occur more frequently or increasing the number of sign-up slots, would allow greater visibility into the breadth of what goes on in Naval STEM. In the same way, program-wide training sessions or seminars could be organized virtually so that interns across the range of NREIP sites have a chance to participate. Finally, encouraging mentors and project leaders to incorporate interns into meetings with other coworkers would help foster more connections with colleagues.

D. Social and Professional Networks

Rs spoke about how the program impacted their social or professional networks. In the section that follows, we summarize the types of interpersonal connections interns made during the program that enhanced their networks. We describe what individuals attribute to NREIP which enabled building these social and professional relationships as well as several challenges that could pose limitations to interns hoping to expand their networks.

1. Impacts

About a quarter (27%) of interns ranked social or professional network as the area where they gained the most during the program. IDA's analysis found three types of relationships or connections interns formed during the program which impacted their network: 1) building a relationship with a mentor and/or another co-worker, 2) building a relationship with another intern, and 3) building a relationship with a professional external to their day-to-day work.

NREIP provided interns an environment to build a relationship with an assigned mentor or another professional involved in their project work. Every intern interviewed had at least one mentor and most characterized their relationships as familiar and positive. Some interns described building rapport with their mentor even before the program started.

A few individuals talked about how the mentor reached out to provide information such as potential housing options, logistics information, or general details on projects they might choose to get involved with at the site. The mentor served as the most significant point of contact throughout the program duration, with the majority of interns interacting with their mentors on a daily or nearly daily basis. Interns described both in-person and virtual interactions (Zoom, Teams, text, email, etc.) with their mentor to review the past week's work, talk about what was done well and what needed improvement, and review next steps. Some interns brought up how the relationship with their mentor evolved beyond the nature of their project work and thus permitted the intern to pose questions about life topics, like graduate school choices, navigating the workspace, and what life is like for DoD scientists. About half of Rs reported working with their mentor on a team consisting of other interns, post-docs, or other permanent employees. Several Rs added that these other team members contributed to their mentoring as well, with someone like a post-doc offering a valuable perspective paired with that of their mentor. One R shared how she developed a connection with a team member sharing the same office space.

> *So sharing an office with another coworker that became a, that was a daily interaction, um, and that was very relaxed in that we were able to talk about the different projects we were on to help bounce ideas, but then also bring up and say, like I was thinking about this. How is it? Like, how is XY and Z like here? If I were to move and get a job? Um, what made you decide? So it was that more personal and less professional, but trying to still figure out about the work.*

This R shared an office space with another co-worker on her project whom she spoke with every day which resulted in the two forming a connection. Developing relationships from professional experiences provides an opportunity to have contacts across career fields and career stages who can offer a diverse range of perspectives about career paths and job roles.

Additionally, interns formed relationships with other interns working at their NREIP site during the program. All 37 Rs stated having some awareness of other interns working at their site. Only one R was clear about being the sole NREIP intern at their site. Out of the other 36 Rs, 15 reported awareness of other NREIP interns while 21 were not clear on which program the interns were from. Slightly fewer than half of Rs described ways in which the intern 'cohort' ended up interacting socially outside of work. From these comments a sense of community was evident, entailing an ongoing group chat for socializing and making plans, eating lunch together or grabbing coffee, checking out local restaurants or museums, etc. Several Rs who were not local to the area ended up becoming roommates with other interns for the course of the program. While only a few Rs worked on teams with other interns, several others reported collaborating with interns outside of their team, getting feedback on tasks, sharing knowledge, and demonstrating skills. One

individual described the benefits from connecting with interns from other disciplines during the program.

> *I'm not necessarily working with any of them on my particular project. But I do get to engage with them closely, which is interesting, because I get a little insight onto, like, what they're doing. And there have been opportunities for me to jump in and engage on other ongoing intern projects, which is really cool. And, you know, for somebody like me who is a [Discipline A], you know, a data scientist by training. Coming here and learning about [Discipline B], you know, is really cool. And those have been opportunities that I've been really happy to jump in on when I can. Just to, you know, get some different experience and just kind of see what else is out there.*

This individual developed a professional relationship with other interns during the program which allowed her to learn more about their projects and other research that was conducted at her NREIP site. Connecting with peers during a shared professional experience could lead to a long-lasting relationship and potentially help advance one's career in the future.

The third network gain interns made during NREIP was building a relationship with a professional external to their day-to-day work. About one-third of the Rs described making connections with individuals at their site in another office space or area at their site. In a few instances, interns networked with other researchers and staff at a different location from their designated NREIP site. Most of the interns who made connections with other individuals outside of their immediate project team described their conversations as friendly and flowing organically. The Rs conversed about a range of professional topics, such as perspectives on specific career roles, working in the defense sector, and future opportunities as well as chatting more informally. This sentiment was not brought up as much as we anticipated in the interviews. One intern even met another scientist at his site by happenstance who ended up helping him resolve a research problem on his project.

> *I've met people that I can lean on, like just random. ...I grabbed a burger from a food truck at right after that and ran into a guy who I thought who, uh, turned out to have some skills that I figured that my team might be able to make use of. the elder engineer nearing. Yeah, elder engineer, nearing retirement, just grabbing a burger. And he turns out to know some stuff about the exact problem that myself and the engineer have been, um, beating our heads against for the last week.*

This intern connected with another scientist through a chance meeting who had the necessary expertise his team needed to sort out a difficulty in their research. Connecting with others offers a chance to mutually exchange knowledge and acquire new ideas which could benefit both people's career growth.

2. Facilitators

The interns shared in the interviews how they were able to make these different social and professional network gains. There were two drivers that helped interns build relationships or connections with others: 1) having frequent interactions with and being in close proximity to an individual and 2) participating in planned networking activities.

The frequency of the interactions with a person and the proximity or physical distance to that individual at their site were important in assisting interns form relationships to grow their social or professional networks. Recurring team meetings offered a chance for interns to get feedback on their work while providing a designated time to connect with other co-workers and interns. Those interns with a more structured mentor interaction frequency, such as standing weekly meetings, also tended to have a work arrangement that involved either or both parties working from home part of the time. This structure seemed to act as an anchoring point for them, given that informal drop-ins were not as feasible with their work arrangement. Several Rs mentioned that the mentor's office was next door or nearby, and this seemed to facilitate the frequency of such informal interactions and discussions. Many interns shared an office space with an individual who they spoke with daily which helped them to develop a connection. One R who did not mesh well with their mentor connected with the other interns sharing the same office.

> *If there was one, like, 100% positive gain that this summer had over last summer it is that last summer I really didn't talk to any of the other interns much at all. And, this summer, I definitely do. We talk all the time. We all work in the same office. They have honestly at times been more helpful to me than my mentor has, despite them also being students that are there to learn. And it's not their job. So, no, I definitely say it's a really, really big part of it. Meeting like-minded people, that are passionate about the same things as you and getting to kind of hear other perspectives. It makes me think about, you know, my own academic path and my own options for the future and it's very, very, very cool to see.*

This R cultivated a strong connection with other interns sharing the same office space who they spoke with on a daily basis. An office or workspace near someone else creates more opportunities for conversations which helps build rapport between people.

Planned networking activities also played a part in interns forming connections with other individuals to boost their social or professional network. Rs recounted a range of group activities organized by their coordinator or some site leader that granted a chance to see and talk with other interns. A little less than half of Rs referenced activities such as base tours, field trips to other sites, luncheons, lectures, and social hours. All of these social and professional activities allowed the interns to meet other interns and employees providing a sense of community, which aided them in developing relationships with others during the program. One individual described an organized group that provided networking

opportunities for employees at her site location and by attending those events she was introduced to new people at her site and later cultivated a relationship with them.

> *I made a lot of connections, especially when, um, going to different events that they had, because the base has this thing, it's called the New Professional Network. So it's where interns and, like, new hires can go and meet people and learn about what other departments do and then go see tours of the different areas. Um, so that helped me make a lot of connections, especially with the other interns and other people that, like the team introduced me to that can help me, like, later in my professional development.*

This individual was able to develop connections with those outside of her project team by participating in networking events specifically organized for new employees at the site location. Planned events or activities offer the chance to meet and socialize with new people that can facilitate in building relationships.

3. Challenges

IDA's analysis found several challenges that interns expressed as impediments to developing connections to make the network gains they hoped to achieve during their time at NREIP. More than half (59%) of interns ranked social or professional network as the area where they gained the least during the program. The two hindrances to building relationships or connections with others that interns cited were: 1) having limited interactions with or being isolated from a mentor, other interns, or external professionals and 2) having limited networking activities or events.

Some (21%) Rs expressed having limited interactions or feeling physically isolated from certain individuals at their site which constrained their ability to connect with people and grow their social or professional networks. About a dozen interns mentioned their mentored experience could have been improved, where half of those Rs spoke about how their mentor was absent for part of the program to take vacation for a couple of weeks or go on work travel; there were also a few cases where the mentor left halfway through the program. A few Rs also expressed the mentor was located in a different building altogether, which proved an obstacle to receiving guidance and developing the relationship. About half of the Rs did not work in close proximity to other interns at their site. For example, one individual described their site location similar to a large university campus where each building houses a different area of research and the other NREIP interns were dispersed across buildings. Having to walk between buildings in a new and unfamiliar area, sometimes with security restrictions, greatly reduces the frequency of interacting and connecting with other interns spread across the site by chance. A few individuals had long commutes that proved a hindrance to meeting up with interns living closer to the site or having a work arrangement that put them on-site less frequently. One R found that

connecting with people was a little more difficult due to working in a hybrid arrangement, citing less opportunities to interact with people.

> *Of course, with the hybrid situation, Um, you know, you're limited in your interactions. If it's not like, you know, some people have different on-site days than other people, so not everyone will be on a site at the same day maybe, um, that's really the only thing, though.*

This R describes how working on a hybrid schedule with other people not on-site the same days meant there were less opportunities to interact, which was a hindrance to building relationships with them. Limited interactions with others due to mis-match in schedules can lead to feeling isolated and diminishes interns' ability to build strong relationships during the program.

Several interns also voiced limited networking activities or planned events, which they felt stifled their ability to meet others outside their day-to-day working environment. About half of Rs also did not mention cohort-organized social interactions such as a sending or receiving a group message, grabbing a coffee or meal together, or making plans for gathering after work hours. A few individuals also commented that the organized tours had a prohibitively limited number of slots and that not all interns were able to participate. Learning not all interns were able to participate in tours offered during the internship was surprising. One individual shared how during the program his interactions were limited to his small team and could have benefited from planned activities to help grow his professional network.

> *I kind of just feel like, um when I went into the lab, there would, it would mostly just be me and my mentor and the other interns. And I felt like, um… I guess, there wasn't a ton of room for interaction with other labs, which I mean makes sense to some extent, because there's a lot of very different stuff happening at [the site]. Um, but, um, yeah. I kind of just feel like, um I don't know. I guess my, my professional, I wouldn't say my professional network really expanded too much this summer.*

This individual talked about how the lack of planned activities or events prevented him from interacting and building connections with other employees or professionals beyond his mentor and the other interns. Providing planned events or coordinated opportunities during the program for interns to meet other staff outside of their small project team could help them develop relationships and grow their social and professional networks.

4. Summary and Recommendations

Interns' participation in NREIP helped them grow their social or professional networks through developing connections with their mentor, co-workers, other interns, and professionals. The number of interactions with an individual and planned networking

activities or events made available to the interns facilitated their ability to build these relationships. Some individuals felt their inability to make gains in their network were hindered by a circumstance where they were isolated from a mentor, other interns, or external professionals or there were limited activities or professional occasions to connect with people.

To help interns grow their social or professional networks, ensuring their office space on site is near their mentor can encourage more frequent interactions. Also, the mentor should communicate with the intern any planned absences at the beginning of the program as well as establish consistent meeting times early in the 10 weeks. Especially in cases where the intern or mentor has a hybrid or remote working schedule, it is important to coordinate times to meet since technology becomes a barrier to casual or spontaneous interactions. Another way to aid interns in building relationships is through organized group activities or network events where they can interact with other interns or professionals. When organizing activities, considerations should be made so all interns can participate if they wish and not be exclusive. Some activities should also be tailored to include interns who cannot attend in-person.

E. Additional Insights from the NREIP Exit Survey

Another source of data is a short exit survey that NREIP sends to its interns at the end of their internships. IDA undertook a simple analysis to understand the overall responses to this survey, and found that the responses were overwhelmingly positive. Interns in particular ranked highly how much they learned about Navy careers and how willing they would be to recommend NREIP to a friend. On the other hand, two areas with room for improvement were making sure interns could start work in a timely fashion and making sure interns learn about other DoD STEM opportunities.

1. Approach

At the end of the summer internships, interns were asked to complete a short exit survey that was designed by NREIP. Saxman One administered the exit survey to all NREIP interns during the final week of the program. The survey included a few questions about logistics, an open-ended space for sharing feedback, and a set of statements about the NREIP experience that included a Likert scale for interns to indicate their level of agreement. NREIP provided IDA a copy of the exit survey responses in September 2023, after the majority of the summer interns had completed their internships.

IDA first examined who responded to the NREIP exit survey. Overall, 251 interns responded, corresponding to a response rate of 43 percent. While this response rate is low, the sample does include interns from most of the NREIP sites; specifically, 39 of the 45 sites (86.7%) had at least one intern respond to the exit survey. Thus, most of the sites had

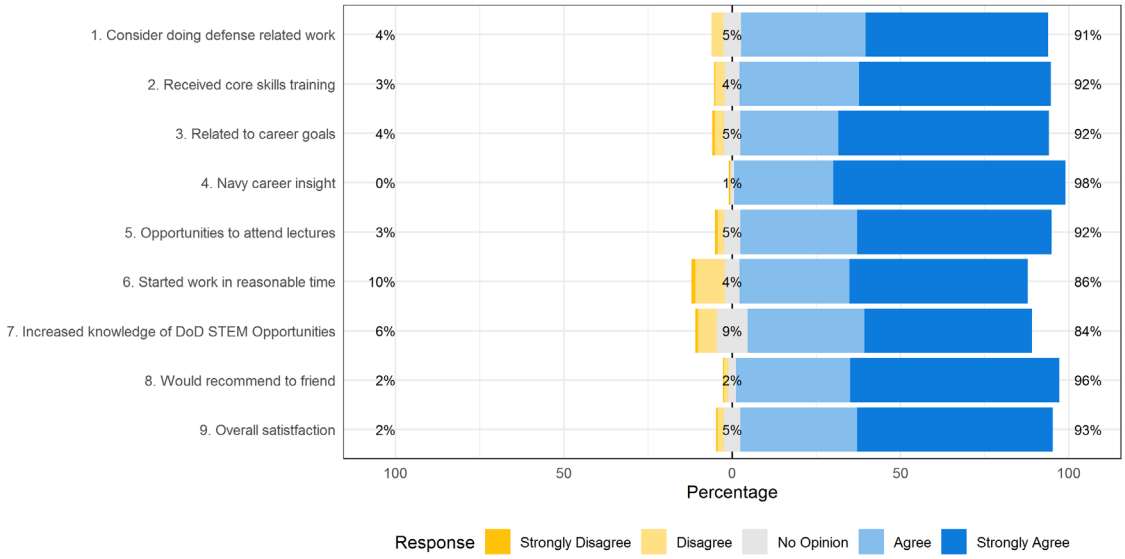
at least some representation in the exit survey responses even though less than half of the total cohort responded.

2. Interns' Holistic Evaluations of NREIP

The rest of IDA's analysis of the exit survey data focused on the statements about the overall NREIP experience that interns responded to by indicating their level of agreement, using a Likert scale that ranged from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

1. After participating in this internship, I am likely to consider working for an organization performing Defense-related work (e.g., Naval labs, industry, academia) as a career option.
2. I received training in core skills (presentation, critical thinking, problem solving, teamwork, professional writing, career management).
3. The NREIP experience was related to my career goals.
4. The NREIP experience provided insight on what it's like to have a career with the Department of the Navy.
5. I was provided with opportunities to attend lectures, seminars, and facility tours in addition to my work duties.
6. I was able to start work within a reasonable amount of time from when I arrived at the lab.
7. Participating in NREIP increased my knowledge of other Department of Defense STEM opportunities (e.g., Science, Mathematics, and Research for Transformation (SMART) Scholarship-for-Service Program, National Defense Science and Engineering Graduate (NDSEG) Fellowship Program).
8. I would recommend the NREIP internship to a friend or colleague.
9. I am satisfied with the overall NREIP experience.

Responses are summarized in Figure 10, which shows each statement along with the percentage of interns that answered at each level of agreement.



Note: For each statement there are three percentages displayed, grouped by sum of "Strongly Disagree" or "Disagree" (left), "No Opinion" (center), and "Agree" or "Strongly Agree" (right). For example, consider doing defense-related work had 4% respond "Strongly Disagree" or "Disagree," 5% respond "No Opinion," and 91% respond "Agree" or "Strongly Agree." Due to rounding, the percentages may not sum to 100%.

Figure 10. Summary of Interns' Level of Agreement with Various Statements about NREIP.

As shown in Figure 10, most of the responses were positive. All but two questions had more than 90 percent of Rs give affirmative responses. Those two questions were about whether they started work in a reasonable amount of time and whether they gained increased knowledge of other DoD STEM opportunities, and both of them have a positive response rate higher than 80 percent. The only question that had at least 10 percent of responses disagree was whether they started work in a reasonable amount of time. Overall, this set of responses indicate that the majority of Rs had a positive perspective in the program.

To describe the results further, IDA converted the Likert responses to numerical scores (see Appendix A for details on the conversion), ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). Using these numerical scores, IDA calculated summary statistics for each question. This approach does not allow for analysis of how the responses to these questions varied across Rs. However, it does allow for analysis of how responses varied from question to question across the entire sample. Summary statistics for the responses to the Likert questions are given in Table 9.

Table 9. Summary Statistics for Numericized Likert Responses

Question	Mean (Standard Deviation)	Median	Mode	Min	Max
1. Consider doing defense-related work	4.42 (0.75)	5	5	2	5
2. Received core skills training	4.46 (0.74)	5	5	1	5
3. Related to career goals	4.50 (0.78)	5	5	1	5
4. Navy career insight	4.67 (0.54)	5	5	1	5
5. Opportunities to attend lectures	4.47 (0.75)	5	5	1	5
6. Started work in reasonable time	4.27 (0.98)	5	5	1	5
7. Increased knowledge of DoD STEM Opportunities	4.27 (0.90)	4	5	1	5
8. Would recommend to friend	4.56 (0.64)	5	5	1	5
9. Overall satisfaction	4.48 (0.72)	5	5	1	5
All responses	4.46 (0.77)	5	5	1	5

Note: Possible answers on the Likert scale range from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

There are a few takeaways from this table. First, the mean for each question was over 4; indicating that positive responses ("Agree" or "Strongly Agree") were the most common. The relatively low standard deviations for each question also suggest a fair amount of consensus around each statement. The median column shows that more than 50 percent of responses were "Strongly Agree" in all but one question. That question asked whether they walked away with increased knowledge of DoD STEM opportunities, and its median was "Agree," as slightly less than half of all Rs put "Strongly Agree" for that question. The mode column shows that "Strongly Agree" was the most common response across all of the questions. The minimum column gives the smallest value that any R gave, and it is 1 ("Strongly Disagree") for all questions except whether they would consider doing defense-related work, where no R answered "Strongly Disagree." The max column shows that every single question had Rs that answered "Strongly Agree."

All in all, these results reinforce what was shown in Figure 10: that Rs were overwhelmingly positive in their responses. There appear to be small differences in how Rs reacted to each question, but the overall positive skew and minimal variability makes it hard to draw inferences about the meaning of those differences. To gain greater clarity and

to assess if there might be relevant differences across questions, IDA next introduced an individually mean-centered version of the Likert data, which is discussed in Appendix A. Ultimately, those results support what is shown in Table 9.

Overall, two questions stand out as having particularly positive responses from interns. The first is the question about whether they gained "insight on what it's like to have a career with the Department of the Navy." Among the interns who took the exit survey, the average response was 4.67 (between "Agree" and "Strongly Agree"). The other question that yielded higher levels of agreement asked whether they would "recommend the NREIP internship to a friend or colleague." The average response was 4.56 (between "Agree" and "Strongly Agree"). Both responses are promising from the perspective of NREIP's broader goal of encouraging students to pursue DoN S&E careers, in the sense that the higher scores suggest NREIP is providing insight into and—perhaps more importantly—doing so in such a way that interns are willing to endorse to others.

There were two statements that yielded slightly lower levels of agreement, though their overall averages still ranged between "Agree" and "Strongly Agree." The first asked interns how much they agreed with the statement, "I was able to start work within a reasonable amount of time from when I arrived at the lab." While interns overall agreed with this statement (mean score of 4.27), it was more muted than their responses to other statements. Since the interview component of the study also revealed that there were some interns who experienced bureaucratic hurdles and other factors that caused work delays, it would be worth exploring strategies for streamlining the onboarding process.

The second statement that received slightly lower levels of agreement from interns (mean score of 4.27) was about NREIP helping to increase their knowledge of other DoD STEM opportunities. This finding is not concerning, since NREIP's stated goals are explicitly oriented around increasing engagement with DoN careers and opportunities. While some interns may have, as it were, been able to learn about broader DoD STEM opportunities during NREIP, this does not appear to have been a primary focal point of the program.

3. Summary and Recommendations

Overall, the NREIP exit survey yielded overwhelmingly positive responses, as summarized in Figure 10. Importantly, interns felt like they were gaining useful Navy career insight, which is aligned with an NREIP goal to "encourage students to pursue DoN science and engineering careers." Additionally, the exit survey indicates that interns would be willing to recommend the program to friends, suggesting that interns are satisfied with the program. While all of the questions in the exit survey had positive responses, the two questions that suggest possible room for growth include getting interns working in a timely fashion and exposing them to other DoD STEM opportunities.

The exit survey is a valuable data resource for managing the program. By surveying interns each year, NREIP is able to monitor satisfaction with the program over time. Since NREIP has a decentralized structure that involves 40 or more sites per year, it is also critical to have a mechanism for gathering information across all locations. For example, collected data can be used to identify emergent issues if and where they arise (e.g., a site where it takes an extraordinarily long time for students to start working). Exit survey data may also be used to identify emerging successes that might be leveraged elsewhere (e.g., a site that figured out how to improve the onboarding process).

5. Diversity, Equity, Inclusion, and Accessibility at NREIP

One of NREIP's goals is to increase opportunities for historically underrepresented groups in the DoN. As such, IDA focused part of the interviews on gathering interns' perspectives on where NREIP stood with respect to supporting various aspects of diversity, equity, inclusion, and accessibility (DEIA).

In the sections that follow, we present the interview Rs' perspectives on how NREIP is doing with respect to two aspects of DEIA: accessibility and inclusion. Findings show that accessibility varies across sites, particularly when it comes to securing and affording housing. Findings also show that interns overwhelmingly feel that NREIP fosters a culture of inclusion, where each person's voice is both respected and welcomed.

A. Accessibility

First, IDA engaged interns about NREIP's accessibility, which was defined as "ensuring people have whatever they need to be able to come if they receive an offer." Interns were asked what types of benefits or support NREIP offered that helped make it easier for them to participate and what, if anything, could be done better. When a program is accessible, people who receive offers are able to accept without facing systematic barriers. To this end, IDA's analysis focused on three aspects of accessibility that all potential interns would have to consider: 1) having a place to live, 2) having a mode of transportation, and 3) having enough money to offset expenses.

1. Housing

Overwhelmingly, the most important accessibility issue for interviewees was housing. Even without being prompted about housing, specifically, many interns brought up housing challenges when asked to discuss NREIP's overall accessibility. The importance of housing likely reflects the fact that nearly two-thirds of the Rs had to relocate to NREIP from afar. Moreover, IDA found that even proximate interns found themselves looking for summer housing near their respective sites, due to long commutes. In total, 27 out of the 37 interns that IDA interviewed had to find a place to stay in order to be able to participate in NREIP.

Interns at sites that do not provide housing will have to find somewhere to live, potentially in a town they have never been to before. The housing arrangements interns made were either staying with someone they knew or renting a place nearby. Seven Rs

were fortunate enough to know someone living in the area, such as a friend or relative, who they were able to stay with during the program. One intern, working a hybrid schedule, happened to stay at her mentor's place for part of the program. This mentor offered to let the intern stay over on days the intern went to work in-person as a way avoid the expense of paying for a hotel each week she was on-site. Nine Rs mentioned signing an agreement to rent an apartment or dorm room at a university nearby. Several Rs found housing through short-term vacation rentals (e.g., Airbnb) or other online tools that listed apartments for rent. Interns from three sites said that they received a housing or relocation bonus on top of their stipend that helped offset the costs of relocating.

NREIP sites varied with respect to how, if at all, they helped interns in their searches. Rs from seven sites described receiving information from NREIP staff that helped them find housing, while interns from three sites explicitly brought up the lack of information about housing as problematic. The types of information that interns received included the names and addresses of specific apartments that had short-term rentals close to the site, links to housing search platforms, and contact information for other co-located interns. Rs found it particularly helpful to receive information about specific places to stay. Being able to connect with other interns ahead of the program also allowed Rs to connect with potential roommates and join forces in the housing search.

Interns encountered several challenges when trying to find a place to stay near their site location. First, there was often a limited supply of rental housing that could be leased either monthly or for less than 3 months. Nine of the Rs brought up the lack of short-term housing as a challenge during interviews. As an example, one of the Rs could only find housing that required year-long lease agreements.

> *Because originally the internship, said that all of us interns were on our own to find housing. But we, a lot of us, had to contact back and bring up that all of the apartments and most of the housing would not fund only 10 weeks. They required a 12-month lease. And so they [NREIP Lab-Intern Coordinator] had to negotiate with one of the, um universities to allow us to borrow one of their buildings.*

This R was unable to find housing near their site location that could be rented for only 10 weeks. Fortunately, the NREIP Lab-Intern Coordinator was able to leverage their personal contacts at a local university to help the R and other interns secure an affordable place to live during the internship. Short-term lease agreements are harder to find because the risk of inconsistent income is unattractive to landlords. Most university dorms, however, sit unoccupied during the summer providing an opportune housing option for NREIP interns.

Another challenge that interns encountered was not having enough time to find somewhere to live. Six Rs stated that the amount of time between securing a firm commitment from NREIP was not sufficient to find a place. For example, one individual

talked about only having a week's worth of time before the internship started to find a rental.

> *I heard back from, like, the security review ... like a week before the internship started. And they told us kind of explicitly to wait to find [housing] ... Don't sign any leases or anything like that until the security reviews are approved. And I didn't hear back until a week before the internship started.*

This R explained how the site location told them to wait to arrange a lease agreement until their security information was approved, which gave them only one week prior to the program starting to finalize their housing arrangements. It is difficult to control the timing of events when dealing with the security clearance process, which is external to NREIP and largely unpredictable. Nevertheless, is it important to highlight the impact this type of sequence can have on interns. Securing a rental involves a number of time-sensitive tasks: finding a suitable place, filling out an application, undergoing a credit check, most likely securing a guarantor, transferring funds, signing paperwork, and so forth. Completing these tasks in a short period of time is difficult, especially from afar. This risks having to secure an additional form of short-term housing (e.g., staying in a hotel) while continuing to process the summer rental.

The third housing challenge that interns encountered was the cost of affording a second home. Eight Rs spoke about receiving a relocation bonus from their sites on top of the regular stipend. All of these Rs were from larger NREIP sites. Most were graduate students, rather than undergraduate students. The rest of the interns had to make do with the NREIP stipend. One individual expressed the financial strain of paying for two places during the internship.

> *I had to duplicate costs over the summer. Like I had to have my home, I had to pay for all of that and then I had to pay for an enormous expense here.*

This R had to relocate in order to live closer to their site location while still paying for the expenses associated with their permanent residence. Four Rs described their summer housing in a similar manner, as a second home they had to pay for on top of their primary residence. Students who are not local to the area of their NREIP site and have recurring expenses (e.g., 12-month or more lease) for where they currently live may especially be at risk of being excluded from the program because they cannot afford to move for the summer. It is also important to note that the prospect of affording a second residence varies depending upon the cost of living in the area where the site is located. Renting a place in Washington, D.C., for example, tends to be more expensive than renting in one of NREIP's more rural locations.

2. Transportation

IDA also asked interns how they commuted to their respective sites, since transportation is another key aspect of accessibility. Most Rs used a personal vehicle, though one R rented a car. Several interns mentioned their commute time was between 20 and 30 minutes, whereas a few others talked about driving for more than an hour to get to the site. Four Rs used public transportation (e.g., metro, bus), biked, or walked to the site. Most of those interns also mentioned the generosity of co-workers offering rides, especially if the weather was bad or they needed to stay late.

Interns that did not have cars brought up several transportation challenges that are important to consider. One intern was informed shortly before the program started that she was unable to access the site on bike, which posed a significant transportation challenge for her as this was her only transportation resource available. She also expressed the area surrounding the site location felt unsafe so walking was not a prudent option. Being in a new area without a reliable mode of transportation and having concerns about your personal safety is very stressful and will negatively affect one's productivity in the program. Another transportation challenge was the restricted timing of the transit schedules. One individual explained:

> *There was a bus stop right next to the laboratory. But then the route that takes you more directly towards DC stops at, I wanna say around six. So for those who are coming into work a little bit later or wanting to stay later to finish experiments that caused difficulty.*

This intern enjoyed the convenience of a bus stop location in close proximity to their site location but the last scheduled pick-up time was not very convenient if they needed to stay a little past the typical work day. Research experiments can often take longer than anticipated and an intern having to time their work around a limited transportation schedule can add stress to their day.

Due to space and zoning requirements, military sites are often located outside the central district of the closest town or city. As such, there may be fewer public transportation options for interns to use. Several interns talked about the lack of public transportation or other resources available, which several Rs explained was the reason they chose to drive their own cars. One intern ended up getting a flat tire during the program and luckily had a kind co-worker help her get to the site until she was able to get her car fixed because there were limited transportation options nearby. One R explored the idea of renting a car for the duration of the internship as a possible workaround. This ultimately did not work out due to his age. Many rental car companies impose an additional fee for younger renters; most commonly, anyone 25 years of age or younger. As someone under age 25, the R would have had to pay additional fees on his summer car rental, which made it prohibitively expensive. Consequently, the R ended up using the stipend to buy a used car, which ended up being cheaper than renting the car so he could have reliable transportation to commute

to the site. All traditional undergraduate students and even some graduate students would be younger than 25-years old and unable to avoid the addition rental car restrictions.

3. Stipend

As the housing and transportation examples illustrate, the stipend is a critical aspect of NREIP's accessibility. For example, one R said:

> *I think the experience would have been good, but I think I would have passed it down if I didn't have a stipend… I had to pay for an apartment, I had to pay for groceries, and I had to pay bills. So, I really, really needed this stipend. It was extremely beneficial to me, and ultimately it really drew me forward.*

This R lived just far enough away from her site location that she needed to relocate for the summer in order to manage the commute. Without the stipend, she would not have been able to afford the rent and bills at a second residence, let alone routine costs like groceries. The stipend was so important for enabling her access to the program that she specifically stated that she would have declined the offer if a stipend was not provided.

Overwhelmingly, interns expressed gratitude for the stipend that NREIP provided, since they knew that this was not universal across all internships. They judiciously discussed the stipend, seemingly in the interest of protecting it for future interns. That said, the analysis still revealed variation in how well the stipend covered the costs associated with NREIP. Thirteen Rs thought that the money NREIP provided was limited, but still ultimately sufficient. Most of these Rs received a bonus as a prior NREIP intern, additional money as graduate student, or some other form of financial support on top of the base stipend.

Ten Rs found that the money was not enough to cover expenses. Notably, most of these interns had relocated for the summer since they did not live close to their assigned sites. One R, for example, was unable to find housing near the site location that fit the budget provided by the stipend. Consequently, she had a "super commute" on days that she had to attend in person, which she found taxing. Several other interns pointed out that the stipend was not adjusted for the cost of living at the respective sites, which could make it harder to survive at certain locations. This created a potential inequity in the sense that a fixed stipend amount will go much further for interns assigned to rural southern locations than, for example, to California.

IDA's analysis revealed that the stipend is critical for enabling access to NREIP. The stipend helps offset housing, transportation, and other costs—regardless of whether one is local or relocating. That said, the importance of the stipend may be higher for interns that have to relocate, since not everyone can either stay with friends in the area or afford rent and utilities at a second residence. For example, one intern used the stipend to pay for half of their summer rental, but the rest came out of pocket. It is possible that not all interns

would have been in a financial position to do the same. The cost of living also varies considerably across the United States of America, which means interns may face systematically varying amounts of financial strain depending upon where they were assigned.

B. Inclusion

IDA next asked about inclusion, which was defined as "ensuring people feel included, valued, and supported while at work, even if they come from a different social, economic, regional, or cultural background." As before, interns were first asked to discuss how NREIP was doing and then asked what, if anything, could be done better. Most of the Rs reported that the working environment at NREIP felt inclusive. However, interns varied with respect to how they thought "inclusion" manifested on a day-to-day basis.

The first way that interns interpreted inclusion was as the presence of demographic diversity among the interns and staff at a given location. Nine Rs touched upon this aspect of inclusion, among others, when asked how NREIP was doing from an inclusion standpoint. In two cases, the Rs said that they were not sure how NREIP was doing with respect to inclusion because they predominantly saw white interns and staff. The other seven Rs praised NREIP for its demographic diversity. As an example, one R said:

> *I feel like I definitely did see a wide variety of people at the base was good, because usually when you go into STEM, it's mostly, like you're gonna see, like, white men. But, um, through NREIP that was different. There were a lot more women than I thought they were gonna be. And there were people of, um, more diverse backgrounds, so that was good to see, I feel like NREIP did that well, and there were a lot of interns there, and they were all, um, different groups of people, which I thought was good.*

Seeing more diversity in race, ethnicity, and gender at the site location, compared to what she would have expected for a STEM workplace, gave her a sense that NREIP was an inclusive environment. Another R similarly associated inclusion with the demographic composition of the community when explaining why she thought NREIP was inclusive. Specifically, she described a conversation with her mentor, who said that he was trying to recruit more women into NREIP in effort to increase diversity in STEM.

The second aspect of inclusion that interns raised was mutual respect regardless of one's demographic background. This was the most prominent aspect of inclusion that interns keyed in on, with 23 Rs touching upon it when discussing NREIP—and none expressing reservations. For example, one intern shared:

> *I have felt supported here as a minority. I felt really supported here. Um, I felt, um, like my voice mattered and things, and I think, um, you know, I just had to keep going back to that fundamental mindset of, um that, like, like I matter.*

This R's quote reveals two important pieces of information. First, she was aware of her minority status, which she later identified as female and non-white. Second, in spite of her differences, she felt strongly supported and valued in the NRIEP program. Her last statement about having to remind herself, "I matter," suggests NREIP may have stood out as an unusually inclusive environment for her.

Mutual respect was also understood as an absence of discrimination. For example, one R said that they thought their site was a very diverse place in which "I've never felt discriminated against or unsafe or threatened for anything demographically." Above all, interns manifested mutual respect as feeling like their voices mattered. For example,

> *I think, everybody—regardless of age, gender, country of origin, whatever—gets ample opportunity to speak. And, you know, when people do speak their thoughts [they] are considered accordingly and aren't brushed to the side.*

This intern worked at a site where each person's ideas were valued regardless of who they were or where they came from. He later described how this impacted the work:

> *What it really comes down to is respect. Do people have an environment where they feel comfortable interacting with other people and sharing their ideas, fostering new ideas and new opportunities or new avenues to pursue, right? And I think that's something that our branch does really, really well.*

Psychologists would describe this type of environment as possessing "psychological safety" (Edmonson 1999), in the sense that the respect conferred to people's voices helped facilitate a free exchange of ideas, which enabled the team to excel.

The third aspect of inclusion that interns honed in on when discussing NREIP was as finding ways for people of all backgrounds and circumstances to participate. Specifically, 13 interns pointed towards accommodations, among other aspects, when evaluating NREIP's inclusiveness. One individual talked about a consideration that was made after they were unable to fulfill the established work arrangement at their site location.

> *So I've tried to be there every week. Um, for a couple of days each week. The last couple of weeks, Um, have been less than that. Yeah. I have constraints that prevent me from being there in person all the time. And this group has been very flexible with me, uh, and letting me be remote for, uh, a large portion. So that's worked out nicely.*

This R had a circumstance that prevented them from working in-person every day at their site location. In response, the site granted them a hybrid work-arrangement as an accommodation so they could complete the internship.

Reasonable work accommodations offer flexibility for interns to continue their duties without being fully excluded from participating from the program. Another accommodation that multiple interns praised was flexibility in one's schedule, since this

allowed them to care for their medical needs, tend to family emergencies, and take leave on important religious holidays that were not on the federal holiday list. Lastly, interns described how they disclosed disabilities to their mentors, who responded by accommodating their specific needs.

There were two Rs who thought that NREIP could do better when it came to proving accommodations for interns. Neither identified as a demographic minority of any kind. One R felt excluded by their mentor for taking some necessary medical leave.

> *There have been times where I've had to miss to handle medical situations that I have… I've said [to my mentor], "if you need me to provide documentation of why I missed a certain day, I absolutely can." But my mentor has said that, basically, he sees it as a lack of effort that I am putting forth.*

This R was absent from some of the internship for a medical reason but felt discriminated by their mentor for missing work. The R went on to describe the discomfort they felt from having to disclose their medical condition to their mentor. On the one hand, they did not want to disclose "all the gory details" of their medical circumstances. On the other hand, they really did not want their mentor to believe they were trying to skip work since this was what they wanted to do as a career.

The other R felt excluded because the site insisted on in-person participation, even though none of the work was classified. This created a challenge for him because having to pay for a second residence strained his limited financial resources. In his view, not offering remote work arrangements created an inequity in who was able to participate in NREIP.

> *When I met with the first person who hired me at this internship, uh, or to do this internship. Uh, he said that "Oh, most of the people that we get for this program are local. Um, because we can't recruit anyone outside of this geographic radius. And the people who do come from outside of that radius, their parents are extremely affluent. Like they'll move there so that the kid or whomever can, uh, commute there." Well, then you're just perpetuating like some class stuff there. It would be great if they had some way of leveling the playing field with respect to, you know, economics.*

This R's conversation with the NREIP staff member highlights an important set of considerations if recruiting interns nationally. On the one hand, national recruitment allows the government to recruit talent from wherever they may be in the country. However, national recruitment can create a potential inequity in who gets opportunities if corresponding accommodations are not made to help students coming from afar.

It is noteworthy that the two interns who expressed reservations about NREIP's inclusiveness attributed their feeling to a lack of accommodations that were present at other sites. Collectively, this suggests a potential inequity across sites with respect to the types

of accommodations being offered. The possibility gains further strength from IDA's analysis of the Site Inventory, which revealed variation in, for example, the types of work arrangements offered at each site (see Section 2.B). While the vast majority of interns praised the inclusiveness of NREIP's environment, a potential inequity in accommodations risks tarnishing NREIP's broader efforts to provide opportunities for historically underserved communities.

C. Summary and Recommendations

Accessibility varies across sites, particularly when it comes to securing and affording housing. Housing challenges impact interns who do not live close to their NREIP site location and have to move in order to participate in the program. Economically disadvantaged and non-traditional students who need to relocate may be especially at risk of being excluded from the program. NREIP/program site locations could provide housing such as an on-base option or explore connecting with local universities that rent dorm rooms during the summer. Having hybrid or remote work positions available would also ease the burden of relocating for interns who are not local to the geographic area of a site location.

Most NREIP sites are difficult to access with public transportation. This creates a potential accessibility issue for interns who have physical limitations on their mobility, do not have a car, or have a car but relocated from afar and were unable to transport the vehicle to their assigned site. To address these challenges, sites could consider expanding the use of hybrid and remote participation for unclassified work. Also, before the internship begins, each site could survey their incoming interns to assess their transportation needs and offer solutions when possible.

Housing and transportation challenges underscore the importance of providing a good stipend to help offset costs. Interviewees were overwhelmingly grateful for NREIP's stipend, though they also politely acknowledged some of its limits. Interns are paid the same stipend according to their academic level, regardless of whether they have to relocate to NREIP. Interns who relocate have several participation costs (moving expenses, temporary housing, and some form of transportation if unable to bring their car) that systematically reduce their earnings in ways that interns who work remotely or were recruited locally do not. Another factor that can impact the stipend's purchasing power is variation in the cost of living. The grocery bills for interns assigned to sites in urban centers, for example, will likely be much higher than those for interns assigned to less expensive localities.

IDA's analysis revealed that interns overall feel that NREIP provides an inclusive environment, where each person's voice is respected. Across sites there is some degree of demographic diversity, which gave interns the impression that people of all backgrounds and circumstances were welcomed. NREIP should continue to support inclusion of

underrepresented groups in the program and reasonable work accommodations for interns with disabilities or other constraints to further reduce possible inequity. The program could also consider having trainings on workplace flexibility for mentors/site location staff and providing resources about requesting accommodations to interns to help promote inclusion across NREIP site locations.

6. Key Findings and Recommendations

IDA conducted a multi-method evaluation of NREIP to deliver a comprehensive set of information on the 2023 execution year. Methods included: an analysis of applicants and awardees; an inventory of 2023 sites; semi-structured interviews with a sample of 2023 interns; and an analysis of the exit survey given to all 2023 interns. In this conclusion, we provide a summary of key findings and corresponding recommendations.

A. NREIP helps interns develop their STEM/Technical knowledge and skills.

The greatest number of interns that IDA interviewed, almost half, ranked STEM/Technical Development as the area in which they gained the most from NREIP. In particular, interviewees reported that NREIP gave them an opportunity to apply and refine the technical skills that they had acquired at school in a hands-on setting. For example, several interns thought that NREIP helped teach them how to tackle more complex research problems than they had previously encountered at school. NREIP also gave interviewees the opportunity to expand into new technical areas and become more familiar with the research and development process, both in general and in the government.

Seeing the real-world impact of the work that they did was invaluable for many interviewees. Interns directly linked their new skills and knowledge areas to their future prospects at school and in the labor market. New knowledge and skills increased one's capacity for various kinds of work. Interviewees also appreciated the boost that NREIP had on their resumes. Publications and new skills added important lines to their resumes that helped increase their marketability. Moreover, the credential conferred from becoming an NREIP alumnus demonstrated their familiarity with research and development in a government context.

Interviewees attributed their gains in STEM/Technical Development to several factors. First, the work that they did at NREIP (e.g., reading background literature for a project) provided an overall structure for learning and refining their abilities. Interns also thought that working alongside mentors, interns, and other STEM professionals helped teach them how people with other areas of expertise and levels of experience approached various problems. Mentors were seen as particularly important for one's STEM/Technical Development, since mentors could teach new material, provide perspective on Naval STEM activities, and demonstrate how to step through a complex research process.

The importance of mentors was further underscored by the way in which some interviewees attributed their relative lack of STEM/Technical Development to challenges in the relationship. Mentors who provided too little oversight, training, or guidance—whether because they were on vacation or otherwise occupied—were especially problematic, since this left interns unsure about what to do or without resources they needed to accomplish their summer goals.

STEM/Technical Development could also be hindered by a mismatch between what the intern hoped to gain from the program and the work they were ultimately assigned. Interns who wanted to learn new skills were frustrated if they were assigned to apply the skills that they already had. Conversely, interns who wanted an opportunity to apply and refine their existing skills could become frustrated if the project they were assigned to was in an entirely new area. Considering one of NREIP's core goals is to "enable students to participate in meaningful STEM research" (Saxman One 2023), it is critical to ensure that interns are assigned to projects that, in their eyes, represent a meaningful step in their development.

***Recommendation**: Sites and mentors should align each intern's unique goals to assigned work as much as possible. To help facilitate the matching process, the program could add the following to the essay portion of the application: "What do you want to get out of the NREIP internship? Which skills and/or knowledge areas do you wish to grow, refine, and/or apply through NREIP?"*

The third limitation to interns' STEM/Technical Development was bureaucratic hurdles. Acutely aware that they had a lot to accomplish in a short period of time, interviewees were frustrated by anything that impeded productivity (e.g., not being able to access scientific articles using their government computers). Such findings are particularly powerful when combined with insights from the broader population of interns who took the exit survey. Among all the experience-oriented questions that were asked, the statement with which interns agreed the least was: "I was able to start work within a reasonable amount of time from when I arrived at the lab."

***Recommendation**: While certain delays are largely beyond site-level control (e.g., clearance process), access- and resource-related delays could be improved. Sites should ensure equipment, access provisions, and other necessary resources are secured at least one week before the first intern, at a given site, starts the program. The additional lead time provides a buffer should unanticipated complications emerge.*

B. NREIP helps interns grow and plan their lives as junior professionals.

Among the interns that IDA interviewed, General Professional Development was the second highest area in which NREIP helped them grow. For many interviewees, NREIP was their first exposure to an office environment. During interviews, they spoke of learning how to work, dress, and act effectively in an office job. Being in a professional environment and observing others also helped interns learn how to address coworkers in an appropriate manner. Interviewees also spoke of gaining non-cognitive or "soft skills" through NREIP. Several interns thought that NREIP taught them how to ask for and find help when needed. Interns also spoke of learning how to work in interdisciplinary teams and honing their public speaking skills.

In addition to helping interns grow as junior professionals, NREIP helped interns look forward to next steps. Of the interns that IDA interviewed, two-thirds said that NREIP helped them identify and refine their educational and professional goals. Interviewees talked about how NREIP helped them become more aware of various career paths that they could pursue in the DoN and elsewhere—as well as the steps one would have to take to pursue them. The exit survey likewise showed strong levels of agreement that the "NREIP experience provided insight on what it's like to have a career with the DoN." Equally important, NREIP also helped several interviewees learn what they did not want to do in their future careers.

Of particular interest to many interns was deciding whether government service was the right fit for their future careers. For most of the interviewees, NREIP was their first foray into the government, which meant it was pivotal for influencing first impressions. Given the limited scope of the interviews, IDA was unable to determine how many interviewees were planning on applying for government jobs post-graduation. However, the broader sample of interns who took the exit survey suggests that many NREIP alumni are interested in contributing to the defense industrial base in some manner. Specifically, 91 percent of the interns who took the exit survey either "Agreed" or "Strongly Agreed" with the following statement: "After participating in this internship, I am likely to consider working for an organization performing Defense related work (e.g., Naval labs, industry, academia) as a career option."

During interviews, interns attributed their General Professional Development gains to two main factors. First, the simple act of working in a professional environment, whether in person or virtually, helped interns gain a better understanding of expectations and decorum. Interns also attributed General Professional Development gains to their interactions with mentors, STEM professionals, and other interns—whether informally or through structured group events (e.g., training, facility tours). Interacting created opportunities to benefit from other people's perspectives, receive supplementary training, hear about opportunities, and see how people further in their careers embodied their professional identities on a day-to-day basis.

***Recommendation**: Sites should encourage interns to engage other interns, STEM professionals, and staff outside of their project teams as much as possible, since interns gain a lot of training and career ideas from these interactions.*

During interviews, interns identified two challenges to making progress in General Professional Development. First, several interviewees described difficult relationships with their mentors, which resulted in insufficient training and oversight. Mentoring is a core stated goal of NREIP, yet various aspects of IDA's analysis suggest variation in how mentors are supporting interns. For example, the Site Inventory revealed that mentors at different sites receive different types and levels of training on mentorship. The Site Inventory also revealed that sites differ in the type of performance feedback they are providing interns. Collectively, these points of variation may put mentors on unequal footing when it comes to knowing how to support interns. As such, it is not surprising that a few of the interviewees who had attended NREIP multiple times, each time working with a different mentor, reported unexpected and dramatic variation in their mentee experiences. It is important to remember that, new to the government—and, in many cases, professional environments—interns rely on mentors to help guide them in how to approach tasks, coworkers, and other aspects of the professional environment. Without this support, interns can feel adrift in their efforts to accomplish work without knowing how to do it.

***Recommendation**: The program should develop a baseline set of guidance, training, and expectations for mentors at all sites to provide a more equitable mentoring experience across sites.*

***Recommendation**: The program should set a baseline feedback structure for all interns; for example, all interns will receive, at minimum, an interim progress meeting and a final evaluation from*

their respective mentors. Sites should also encourage mentors to provide interns ongoing feedback throughout the program, to promote early course correction and maximize growth.

***Recommendation**: Lab-Intern Coordinators should schedule a one-on-one check-in with each intern around week 2 or 3 of the program period to identify any mentor-related challenges so they may be addressed as early as possible.*

The second challenge to interviewees' General Professional Development was a lack of structured activities at their respective sites. While the exit survey showed high levels of agreement about receiving core skills training (presentation, critical thinking, problem solving, teamwork, professional writing, career management), the Site Inventory revealed that sites vary considerably in the professional development activities that they provide. In other words, it is possible that interns at most, if not all, sites receive *some type of* professional development activity, though it remains unclear if the *amount and quality* are consistent across locations. This possibility is supported by the interview findings, with several interns describing an absence of professional development activities at their respective sites. Interns were particularly looking for seminars or other events that would help them better understand how to navigate the future job market.

***Recommendation**: The program should designate a baseline set of professional development activities for all sites to adapt and implement. For example, all sites, at minimum, could provide interns a networking event, a facility tour, and a training session or seminar.*

***Recommendation**: The program should develop and administer a series of mandatory events that focus on increasing interns' knowledge of what Naval STEM does and how to become more involved. For example, the program could host webinars over the course of the summer on the following: (1) Introduction to Naval STEM Entities, Activities, and Impacts; (2) How to Find and Apply for other Internships and Educational Opportunities that are either in or Work with Naval STEM; and (3) How to Find and Apply for Naval STEM Jobs. Webinars should be recorded to ensure access for any interns who are unable to attend the live event.*

C. NREIP can help interns enhance their professional and social networks under certain conditions.

On average, the interns that IDA interviewed ranked the enhancement of their Professional and Social Networks as the area in which they made the least gains through NREIP. A closer look at the data reveals that interns tended to rate network gains as either their top or bottom area of growth. IDA conducted an additional layer of analysis to better understand why interns were so divided in their networking gains. The analysis showed that the primary differentiator was whether an intern had access to networking events or key gatekeepers (e.g., mentors) that would help facilitate introductions to others.

Interviewees talked about forming network ties with three key types of people: mentors and other STEM professionals on their projects, fellow interns, and STEM professionals on other projects and at other organizations. Each of these ties provided important resources that supported interns' growth. Forming strong ties with one's mentor was key for accessing information on projects, logistics, and other resources (e.g., housing). Postdoctoral fellows and other interns could offer insight into different developmental paths and disciplinary perspectives. As people at similar stages of their careers, they were also important sources of information of other professional and educational opportunities. Spending time with other interns and fellows, both at work and on the weekends, also fostered camaraderie and created a sense of community that interviewees valued.

Some interviewees were also able to network with STEM professionals at other organizations, which helped them learn about possible careers and, more broadly, the different ways in which someone could contribute to defense. Interviewees attributed two factors to their enhanced Professional and Social Networks. The first factor was frequent interactions with others, whether at recurring team meetings, around the office, or during standing meetings with their mentors. Interviewees appreciated being assigned office spaces or desks that were co-located with other interns, mentors, and STEM professionals, since the proximity provided quick access to help and helped facilitate both bonding and collaboration. Interviewees also expanded their networks through regular interactions with mentors, whether from working close by or, for those working remotely, from weekly standing meetings.

The second factor, structured group events, is best understood alongside findings from the Site Inventory. IDA collected information on how many group social activities each site organized for their respective interns. Analysis revealed considerable variation in the number of group social activities organized by each site. The importance of these differences is demonstrated by interview findings, which showed that interns strongly attribute networking gains to structured group activities (e.g., base tours, field trips, social events), regardless of whether the ostensible purpose was networking.

To further underscore the importance of both factors, interviewees attributed gaps in their network growth to the absence of either. For example, interns found it difficult to connect with others if they were physically isolated, whether because they were the only intern at their site or because the other interns were dispersed across buildings. Interns who spent a lot of time working remotely also found it difficult to network unless they took concerted steps to connect with others through virtual meetings.

***Recommendation**: Interns vary in how sociable they are, but they are united in their desire to expand their networks. Sites could help expand networking opportunities by ensuring that (a) interns working on site are physically located as closely as possible to mentors, staff, and other interns, and (b) interns working off site attend weekly virtual meetings with mentors, staff, and other interns to connect on both work and non-work-related topics.*

Above all, interns that were unable to attend structured group activities struggled in their network gains. In some cases, their sites simply did not have many structured group activities, though there was also an individual who was unable to access their site's structured group activities due to limitations on the number of attendees.

***Recommendation**: At least one of each site's (proposed) set of baseline professional development activities should focus on helping interns network with other people in Naval STEM and/or the defense industrial base. Prior to the event, it would be helpful to have mentors or other NREIP staff share tips with interns on how to network effectively.*

D. NREIP receives diverse applications from around the U.S., but faces challenges bringing in a diverse pool of upcoming STEM talent.

The Site Inventory revealed that sites are primarily motivated to host NREIP because it helps them identify and develop people for the future workforce. IDA's analysis of the application data suggests that NREIP may be part of a broader community of programs that compete with each other for top STEM talent. Looking at the pool of applicants, the analysis revealed several characteristics that were associated with a higher likelihood of receiving an NREIP offer: females (compared to males), upper classmen and graduate students (compared to freshman and sophomores), computer science majors (compared to "Other" majors), students with higher GPAs (compared to students with lower GPAs), and

students with prior NREIP experience. Yet, IDA's analysis on who accepts NREIP offers showed that all of these groups, except the prior NREIP interns, were less likely to accept. Taken together, these findings suggest NREIP sites may be informally accounting for the fact that students with the above characteristics are in high demand and are therefore extending more offers to these groups. In spite of their efforts, the lower acceptance rate among students with these characteristics suggests that NREIP may be encountering considerable competition for upcoming STEM talent.

***Recommendation**: ONR should engage Lab-Intern Coordinators to better understand how offerees are being selected. The possibility that sites are extending offers to certain demographic groups more than others should be considered in light of the recent Supreme Court ruling on Students for Fair Admissions, Inc. v. President and Fellows of Harvard College (2023), which effectively banished quota systems at colleges. While NREIP is not a college environment, possible demographic-based quota systems invite legal and ethical complications that detract from NREIP's important mission.*

***Recommendation**: ONR should consider commissioning an independent study on why people decline NREIP offers and what they do instead. The study should include a modest incentive, if possible, to encourage participation.*

E. NREIP is strong in certain aspects of inclusion, with room to grow in others.

Recruiting a diverse cohort is especially important considering interns, in part, develop their sense of inclusion by observing demographic diversity at NREIP sites. Interviewers asked interns to assess how well NREIP did in 2023 to foster inclusion. Many interns responded by reflecting upon demographic diversity at their respective sites. In particular, interviewees described how they would look at the demographic diversity of people at the site—to include themselves—and then assess whether everyone was treated with equal levels of respect. Almost all of the interns that IDA interviewed said that they felt welcome and respected at NREIP.

***Recommendation**: NREIP should continue to project its commitment to inclusion through diverse cohort composition and empowering interns' voices both on projects and during events.*

While discussing inclusion, several interviewees did acknowledge that their comments were theoretical, since they did not actually observe that much racial and ethnic diversity at their respective sites. Their impressions were supported by findings from the applicant analysis, which showed that students who identified as Hispanic/Latino or Black/African American were less likely to receive NREIP offers than students who identified as White. Data limitations unfortunately preclude clear answers as to why.

***Recommendation**: ONR should commission a study to better understand variation across racial and ethnic groups regarding NREIP participation. To help facilitate the study, consider changing how certain application data are collected; specifically, school name, home residence, and which lab extended the offer could be standardized more for ease of record-keeping and potential future studies.*

Some interviewees viewed inclusion through the lens of accessibility. In other words, by providing accommodations to help all interns participate, regardless of their background and circumstances, NREIP signaled that differences were both welcomed and respected. Interviewees felt both seen and supported when their sites allowed them to take extended medical leave, tend to family emergencies, honor religious holidays, work hybrid to avoid paying for a second home, or otherwise worked with them to find solutions to potential barriers. Likewise, a few interviewees explicitly brought up the lack of accommodations that they experienced as undermining their sense of belonging. There was one particularly concerning example in which an interviewee felt excluded after their request to take leave and attend to a serious medical condition was denied—and criticized—by their mentor. The differences observed across interviewees in the accommodations provided suggests potential inequity across interns.

***Recommendation**: The program should set policy around the types of accommodations that will be provided to NREIP interns at all sites. To account for unanticipated requests and promote consistency, the policy should also designate an authority who would adjudicate over accommodation requests that fall beyond policy.*

F. NREIP provides mixed levels of accessibility to support interns from a variety of backgrounds and circumstances.

NREIP has sites located throughout the country, which is an important first step towards making the program as accessible as possible to the national population of

students. A student who does not live near an NREIP site may have to relocate in order to participate in person, depending upon the work arrangements available at their site and the classification level of the work to which they assigned. The Site Inventory showed that sites differed in the work arrangements that they allowed, with most requiring in-person participation and a substantial minority allowing hybrid. Hybrid and remote participation options are critical for interns who have families, part-time jobs, financial constraints, or other obligations that make it harder for them to relocate for the entire summer. A number of interviewees participated in NREIP using some type of hybrid option and appreciated the flexibility. The only concern raised by a few people about working hybrid was finding ways of connecting with the people working onsite.

***Recommendation**: For interns working on unclassified projects, the sites could expand their use of hybrid and remote work arrangements to better support NREIP's national recruitment strategy. Hybrid arrangements could look take any form (e.g., a weekly mix of office locations, working on-site at the beginning and end of the program period and off-site otherwise) and should be adapted to each intern's individual circumstances and work requirements.*

Given the importance of networking that IDA elsewhere identified, it will be critical for sites to help interns working offsite set up regular virtual networking meetings with fellow interns, STEM professionals at the sites, and others. Likewise, mentors should, at minimum, have weekly standing meetings with any interns working offsite. Interns who did relocate for the summer were faced with the challenge of finding a temporary residence. Perhaps to avoid this issue, some sites reported that they exclusively recruited interns locally. The Site Inventory showed that sites vary in the housing support provided to interns. Among the 28 sites who answered the housing question, 2 offered some type of program housing, while the remaining 26 expected interns to find something on their own. This expectation is worth considering alongside interview findings, which revealed that the top accessibility concern among interviewees was housing. The majority of the interview sample had to find temporary residences for the summer, since nearly two-thirds relocated from afar and others living beyond, for their specific circumstances, a manageable commute. Some interviewees were able to stay with friends or family in the area, while others sought short-term rentals (e.g., sublets, Airbnb, hotels). Securing a short-term rental was easier said than done, with 24 percent of interviewees describing a lack of availability near their respective NREIP locations. Some interviewees also struggled with how little time they had between receiving a firm commitment from NREIP and their start dates, which made it even more challenging to find somewhere to stay; as an extreme example,

one interviewee expressed frustration about being given only a week to find a place. Some interviewees reported that mentors and other people at their sites tried to bridge the gap by providing information about housing (e.g., links to search engines, names of apartment complexes) and possible roommates. Housing information was strongly appreciated by the interviewees who got it and pointed out as an issue by those who did not.

Many interviewees talked about the challenge of affording a temporary residence. In most cases, interns were expected to pay for short-term rentals (if relocating from afar) using their stipends, though 22 percent of the interviewees received some type of relocation bonus. Interviewees were overwhelmingly grateful for the stipend that NREIP provided, since they recognized that not all internships have one. Nevertheless, when it came to housing, interviewees diplomatically acknowledged its limits. The stipend was not always enough to afford routine expenses (e.g., groceries) and a temporary residence, especially if assigned to a location with a higher cost of living (e.g., Washington, D.C.). One interviewee ended up paying for half of their summer rental out of pocket, which added stress to their time at NREIP. It is important to remember that interns from economically disadvantaged backgrounds may not have such options.

***Recommendation**: NREIP should provide more housing support for interns that are required to relocate and attend NREIP in person. Support could take the form of pre-arranged housing (e.g., renting a set of rooms from a nearby college dormitory), location-adjusted financial assistance, or detailed information about safe, available, and proximate housing. Whichever form of support is selected should be provided across all sites to ensure an equitable experience for all interns.*

The other accessibility challenge that interviewees described was transportation. Most interviewees used personal vehicles to commute to NREIP, with many giving the impression that it was the only viable option. This could present a challenge for interns who were relocating from afar, unless they were willing and able to transport their vehicle to the NREIP site, or who did not own cars. As an extreme example, one interviewee used their NREIP stipend to buy a used car because otherwise they would not have been able to get to the site.

Some interviewees used public transportation to commute to NREIP, which presented its own unique challenges. The ability to use public transportation was not always consistent; for example, if one had to work later than the last ride of the day. Other sites were simply too far from public transportation. The Site Inventory revealed considerable variation in accessibility via public transportation. Fifty-five percent of the sites that took

the Site Inventory were within a 15-minute walk of public transportation, 22 percent were within a 16- to 30-minute walk, and the remaining 23 percent were 31 minutes or more away from the closest public transportation of any kind.

***Recommendation**: Sites should provide transportation assistance (e.g., carpooling, rideshare fund) for interns who need to commute to a lab that is not near public transit and either cannot drive or have limitations on their physical mobility.*

***Recommendation**: For interns that rely on public transportation, work hours should be aligned with route schedules. For unusual situations, sites should provide ad hoc transportation assistance (e.g., carpooling, ridesharing).*

***Recommendation**: Sites should provide information about transportation options and support in the information packet sent to offerees. This creates an opportunity for interns to communicate and receive help with any transportation limitations as early as possible. If a given site's transportation support does not create a viable path forward, consider switching the intern to a hybrid or remote work arrangement or connecting them with another site.*

G. NREIP interns report high levels of overall satisfaction with the program.

Overall, IDA's analysis demonstrates the strength of NREIP as a mechanism for recruiting and developing a pipeline of STEM talent in a wide range of fields. This conclusion is supported by findings from the interviews and exit survey, which both showed overall high levels of satisfaction among interns with their 2023 experiences. An overwhelming 96 percent of the interns who took the exit survey either "Agreed" or "Strongly Agreed" that they would recommend NREIP to a friend, which speaks strongly to NREIP's overall success as a program. In light of this, IDA's recommendations should not be viewed as critiques, but rather as possible avenues through which NREIP can continue to grow.

Appendix A.
Research Strategy

Site Inventory Analysis

Inventory Development

Given the spread of NREIP locations at different facilities around the country, variation in how the program is instantiated became a centerpiece early on in the program analysis. Arriving at an understanding of the how the NRIEP experience is structured and carried out at the site-level was deemed an important prior step that would grant better insight into the development of research avenues for the rest of the study. The ways in which sites differed in their versions of the NREIP experience might condition variation in intern outcomes, and IDA wished to understand these differences before conducting interviews with NREIP interns.

To this end, a short questionnaire was developed for the Lab-Intern Coordinators at each site participating in FY23 that would speak to a range of site-level activities and features, including the advertising methods used to recruit interns, the number of mentors and training they received, work arrangements for interns, professional development resources and group social activities that are offered, how performance feedback is collected, and conversion of interns into full-time hires. These features and activities were identified through a review of the empirical literature on internships and their outcomes, background knowledge from IDA analyses of other STEM internship programs, and discussions with ONR representatives who manage the program.

Collection Procedures

IDA put together a short inventory of questions (~15 minutes) on Qualtrics that would allow a better sense of the unique combination of features at each individual location that participates in NREIP. Information about the purpose of the study, whom to contact regarding any questions, and a link to the online questionnaire was distributed via email to the intern coordinators at sites participating in FY23.

Respondents

The Lab-Intern Coordinators serve as the main points of contact for NREIP interns throughout the program. IDA invited all Lab-Intern Coordinators from sites hosting NREIP interns in 2023 to complete the Site Inventory using an email that was distributed by a

representative from ONR. The email contained a description of the effort, a link to the Site Inventory, and a request to fill it out (or pass it along to someone at their site who could speak to the topics). Of the 45 sites that hosted interns in 2023, IDA received responses to one or more questions from 33 sites. The high response rate (73%) granted a rich understanding of the various contexts in which NREIP manifests.

Analysis Goals

While NREIP is one program in name, given the wide variety of Naval labs and facilities that participate in NREIP around the country, it was previously unknown to what degree the participating labs overlap with respect to how they run the program, and how much they differ. Therefore, an inventory was designed to further understanding of how the sites are operating in practice. Programming features of interest included things like:

- Site locations
- Site reasons for participation
- Access considerations
- Staffing levels
- Mentor training
- Recruiting methods
- Development activities
- Social events
- Evaluation approaches
- Post-participation outcomes

Rather than providing a deep dive on any one site, data from the inventory were intended to grant insight into the spectrum of differences across sites. For these purposes, descriptive statistics were used to report counts, percentages, averages, and ranges for most questions. Some questions benefited from grouping the responses so that larger themes were more evident, such as responses about performance feedback collection falling into categories of being more or less structured. At times, data from several sources were cross-referenced to grant more insight into site characteristics, such as using number of mentors and numbers of interns to arrive at mentor-to-intern ratios.

Applicant and Participant Analysis

IDA conducted a series of logistic regression analyses in order to identify any patterns in what types of people (1) received NREIP offers and (2) accepted NREIP offers. Logistic regression is a statistical technique used to explore relationships between one or more

covariates (e.g., demographic characteristics) and an outcome of interest that is binary (e.g., receives an offer versus does not receive an offer). In this section, we provide greater detail on how each analysis was performed.

Outcome Variables

IDA performed logistic regressions for two different outcome variables. The first was whether or not each applicant received an offer from NREIP. This variable was coded based on the "Admin Award Status" of each applicant in the application data. This column contained information about the applicant's award, and was empty if the applicant did not receive an offer. So, applicants who had values in this column were labeled as "Received an Offer" and those who did not have values in this column were labeled as "Did Not Receive an Offer."

The second outcome variable was whether or not offerees became NREIP interns. This variable was also coded using the "Admin Award Status" column. For offerees (applicants who had received offers), this column contained one of several values: Declined (they turned down the offer), Withdrawn (they accepted the offer, but then had to withdraw that acceptance), Offer Expired (they did not reply in time), Rescinded (the offer was taken back by NREIP), and Accepted (they accepted the offer and became NREIP interns). In order to understand simply who became an intern versus who did not, any "Accepted" offeree was labeled "Intern" and any offeree with another value in the Admin Award Status column was labeled "Not Intern."

Independent Variables

The independent variables in IDA's analyses were chosen because they were likely to have an impact on the outcome variables, and they were accessible in the FY23 application data. This section walks through the details of the variables that were included in the final regression models. Overall, the goal was to include all available variables that could plausibly impact either outcome of interest, while also adhering to the parsimony principle in regression analysis.[12]

There were two types of variables in the analysis: continuous and categorical. Continuous variables are numerical and simply are passed into the model as whatever value they are. Categorical variables typically are translated into a set of 0s and 1s to be passed into the model. For example, the variable measure prior NREIP participation would take a value of 1 if the applicant was a prior NREIP intern, and would take a value of 0 if the applicant was not a prior NREIP intern. For variables with multiple levels, each level was

[12] The parsimony principle in regression analysis says that a model with fewer parameters is generally better. In other words, it was important to avoid including extraneous variables that were not of interest and had no impact on the outcomes of interest.

split out into dummy variables, or factors, that took on the values of 1 and 0 as needed. For example, the variable encoding disability status had three levels ("I do not have a disability," "I have a disability," and "I prefer not to respond"). One of these is chosen as the baseline (in this case, "I do not have a disability"), and then the other two become dummy variables. An applicant who has a disability would be coded as a 1 in the "I have a disability" dummy variable and a 0 in the "I prefer not to respond" dummy variable. An applicant in the baseline category would have 0s in all the relevant dummy variables.

The first set of independent variables all covered demographic factors of the applicants. In this type of analysis, it is important to include demographic variables that may not be explicitly used in determining the outcome variables. This is because the regression analysis shows any relationships between variables that are either intentional or unintentional, and can reveal any unintentional consequences of offer and participation decisions on different demographic groups. The first demographic group that was included in the model was gender. In the original data, applicants were asked to identify their pronouns, with the ability to choose between he/him, she/her, they/them, Other, and I do not wish to respond. To adapt pronouns to be gender, he/him was relabeled male (n = 1102) and she/her was relabeled female (n = 492). Applicants who replied Other or they/them were combined into a nonbinary category (n = 12). There was also the option to reply *I do not wish to respond* (n = 82). Due to the small number of respondents in the nonbinary category, they were combined with the *I do not wish to respond* applicants to ensure that there were a sufficient number of applicants and offerees in each category. So, the factors for the gender variable were: male (baseline), female, and nonbinary or did not wish to respond.

The next demographic variable included in the models was race/ethnicity. Applicants had the opportunity to select multiple racial groups in one question, and could specify their ethnicity in a separate question. IDA simplified race and ethnicity into a single variable. Any applicant who identified as "Hispanic or Latino" was assigned a value of Hispanic or Latino, no matter what race(s) they selected. Applicants who selected more than one racial category were labeled as "Multiracial." Further, there were very few applicants who identified solely as "American Indian or Alaska Native," "Native Hawaiian or Other Pacific Islander," or "Other." So, these categories were combined into a single "Multiracial or Other" category for the purpose of regression. Applicants who chose not to respond to the race question were labeled as "Did Not Respond," unless they had already responded to the ethnicity question indicating that they were "Hispanic or Latino." The condensing of the race/ethnicity variables is summarized in Table A-1, which also includes the number of applicants in each category.

Table A-1. Summary of Condensed Race and Ethnicity Variables Used in Regression Fits

Selection Ethnicity	Selection Race	Number of Applicants	Final Race/Ethnicity Variable
Hispanic or Latino	Anything	260	Hispanic or Latino
Anything other than Hispanic or Latino	Only White	855	White (Baseline)
	Only Asian	258	Asian
	Only Black or African American	120	Black or African American
	Only Native Hawaiian or Other Pacific Islander	3	Multiracial or Other
	Only American Indian or Alaska Native	1	
	Only Other	8	
	Multiple Races	109	
	Did not respond	74	Did not respond

The next demographic variable that was included in the regression models was academic level. This variable is correlated with age, but better captures the academic experience that hiring committees are likely interested in. So, IDA decided to include academic level instead of age in the analyses. Applicants could choose between Freshman (n = 190), Sophomore (n = 397), Junior (n = 641), Senior (268), or Graduate student (n = 192) for their current academic level. Initially, IDA included each academic level as a separate dummy variable in the analysis. However, having five different levels for this variable as well as the various levels of other independent variables led to large standard errors. In order to control the errors in the final results, the academic level choices were grouped into three factors, meant to capture lower-class undergraduates, upper-class undergraduates, and graduate students. In other words, the levels capture undergraduate students with limited experience, undergraduate students with more experience, and graduate students. The levels reported in the results are Freshman or Sophomore (baseline), Junior or Senior, and Graduate.

The final demographic variable that was included as an independent variable was disability. Applicants could identify that they have a disability (n = 77), do not have a disability (n = 1529), or do not wish to respond (n = 82). Though the distribution is heavily skewed toward people who do not have a disability, including this variable did not

drastically impact the standard errors of the models. So, this variable was used as-is, with levels: "Does not have a disability" (baseline), "Has a disability," and "Did not respond."

Moving away from demographic variables, the next independent variable captured the area of study of the applicants. They chose their primary major from a list of 58 distinct majors. Such a large number of distinct categories would leave only small numbers of applicants in each category, and would negatively impact the standard errors in the resulting model. So, IDA decided to group the majors into several groups, which were chosen to partially align with the Department of Education Institute for Educational Statistics Classification of Instructional Programs. IDA went through the 58 distinct majors and assigned them to one of a few overarching major groups. Within the data, Bioscience (n = 113), Computer and Information Sciences (n = 408), Engineering (n = 836), and Physical Sciences (n = 148) each had enough applicants to warrant their own categories. All other majors had too few applicants and were combined into an "Other Majors" category (n = 183).

The next academic independent variable was a measure of the school classification for the school that each applicant attended when they submitted the applications. Applicants self-identified these school names, which were converted by IDA to one of the entries on the Carnegie Classification of Institutions of Higher Education (The Carnegie Classification of Institutions of Higher Education n.d.). Using that classification, schools were split into the R1 tier (which is defined by Carnegie as doctoral universities with "Very high research activity") and all other schools. Overall, this breakdown made for a fairly even split of the applicants, with 53.0 percent of applicants (n = 894) being from R1 schools.

To capture academic performance, the regression models rely on the students' GPAs. The GPA field on the application was open text, and applicants took advantage of that to input their GPA information in a wide variety of different ways. In order to make this field useful, IDA created a cleaned GPA field that updated the GPA field in several ways. First, all non-numerical entries were converted to numerical. This was done by examining each non-numerical entry and determining the best number to assign. Whenever possible, IDA used the most cumulative GPA given (in other words, if the applicant gave a major-specific GPA and a cumulative GPA, IDA chose to use the cumulative GPA). In some cases, the applicant input values that made clear that their GPA was unknown, in which case the applicant was excluded from any analysis that included GPA (this corresponded to 37 applicants). One particular applicant listed their GPA as 7.65. This was a clear outlier above all other GPAs listed, and this applicant was removed from the analysis when GPA was included. Of course, there is no way to perfectly clean the GPA column to perfectly reflect every student, as different schools use different GPA scales and students report GPA in different ways. The method outlined above is a best attempt at capturing the variation in applicant GPAs while removing values that would bias the results unfairly.

The final independent variable included in the regression models was prior NREIP participation. This variable was included because it is possible that prior NREIP applicants are being judged differently than people who have not been in NREIP before. Particularly if they are applying to work at the same location, the people assessing the application may already be familiar with the applicant and know whether or not they are a good fit for the work. Applicants self-identified whether or not they had participated in NREIP before on the application. This identification was a simple binary, so the factors for this variable are just "Not a prior NREIP intern" (baseline) and "Was a prior NREIP intern."

Model Tests

The code for these regressions were written in R, and the regressions themselves were performed using the glm function. A full accounting of the R packages used across the analyses in this report is contained in Appendix D. The multicovariate logistic regression fits a function for the probability of an individual case being in the "success" category of the form:

$$p(\vec{x}) = \frac{1}{1 + e^{-(\beta_0 + \vec{\beta} \cdot \vec{x})}}$$

In this formula, $\vec{x}$ is a vector of values for our independent variables, which are explained in detail above. The overall formula gives the predicted probability that an individual with the characteristics given by $\vec{x}$ falls into the "success" category. For the first fit, the success category was getting an offer, and for the second fit, the success category was becoming an intern.

The β values are the fit parameters. β_0 is the intercept of the fit, and can be used to calculate if the probability of someone in the baseline category (where $\vec{x} = 0$) is a success. The remaining $\vec{\beta}$ vectors are the fit parameters that give the impact of each of the characteristics in $\vec{x}$ on the overall probability of success. Following the typical logistic regression fit process, R calculates significance values, or *p*-values, for each of these fit parameters that allows for the evaluation of which parameters are statistically significantly different from zero. Fuller details on these regression analyses and how R performs the likelihood maximization can be found in the documentation for the glm function.

In addition to performing the logistic regression fits, IDA undertook several additional tests to double check that the results of the fits were valid. First, in order to test for variable multicollinearity, IDA used the generalized variance inflation factor (GVIF) (J. a. Fox 1992). This is a measure of whether any of the independent variables depend on each other. If, for example, all of the female applicants were graduate students while all of the male applicants were freshmen, then two of the variables in the model would exhibit multicollinearity. This would result in an unstable model and would require eliminating or

adjusting some of the independent variables. In all of the models that IDA ran, multicollinearity as measured by the GVIF was not a problem.

IDA also performed a statistical test to measure how well independent variables predicted the outcome variable in the model. This test is called McFadden's Pseudo R squared (McFadden 1973). This statistical test condenses the fit results to a single number that will be bigger when the model is a good prediction of the outcome variable from the independent variables. Typically, a value of 0.2 for this statistic is considered a good fit, and none of the IDA models gave Pseudo R-squared values larger than 0.07. In other words, as discussed in Sections 3.B and 3.C, the models could not fully predict either who received an offer or who participated in NREIP.

As an additional measure of the strength of each model, IDA also examined the Receiver Operator Characteristic (ROC) Curves and specifically measured their Area Under the Curve (AUC) as an additional goodness-of-fit metric (Nahm 2022). The AUC is a metric that approaches 1 as the model approaches perfect predictive capability. A completely random model will achieve an AUC of 0.5. For the models that IDA ran, the highest AUC was 0.68, indicating that the model was doing better than random, but was falling short of prediction of the outcome variables from the independent variables.

With these tools available, IDA approached the data in several different ways to make sure the resulting models were robust. First, IDA identified the appropriate outcome and independent variables as outlined above. Two issues arose during this process. The first was that several of the outcome variables had large numbers of categories (for example, the original number of listed academic majors). Early tests with these variables resulted in models with large standard errors, so IDA decided to condense several variables into more manageable numbers of categories as discussed above.

The second issue was parsimony. There were several other independent variables that IDA could have included in the models. For example, an early version of the model included whether or not applicants specified that they wanted to apply to all NREIP labs. After looking at early versions of the models, this variable had no association with the outcome variables, and there was no reason it was of interest. So, this variable was removed from the models.

Once a reasonable set of independent variables was identified, IDA ran several different models with different subsets of the independent variables to understand how the results depended on which variables were included. However, to look at a manageable number of models, IDA grouped these variables into four separate categories: demographics (gender, race/ethnicity, academic level, disability status), academic major, academic performance (GPA), and prior NREIP participation. The first model that IDA ran included only the demographic variables, the second added academic major, the third added academic performance, and the final model added prior NREIP participation. The

results of these different models are summarized in Table A-2 for the offer analysis and Table A-3 for the participation analysis. For both analyses, the results show that the significant variables mostly do not change as new independent variables are added, which is a good sign for the robustness of the models.

Finally, IDA checked whether interaction terms were important to add to the model. Interaction terms measure the cross between two independent variables. For example, the interaction term between academic level and gender has nine categories (Freshman and Sophomore Males, Freshman and Sophomore Females, etc.). These variables were potentially important because they can capture associations that are different between different subgroups. For example, it is possible that Graduate Student Females are less likely to get offers than Graduate Student Males while Freshman and Sophomore Females are more likely to get offers than Freshman and Sophomore Males. In a model without interaction terms, this would not be apparent.

The interaction terms that IDA tested included: prior NREIP participation with GPA, gender with GPA, race/ethnicity with GPA, academic level with GPA, major with GPA, and gender with race/ethnicity. None of these interaction terms proved relevant for the model, and several of them caused the standard errors across the model to increase drastically. Overall, adding any of these interaction terms did not significantly improve the model fits. Because of these results, IDA decided that there was no need to include interaction terms in the final model.

With all of these considerations, IDA finalized the list of independent variables to those discussed above. These variables gave robust models, and did not include any extraneous variables.

Detailed Regression Results

Summary results and interpretations for two regression analyses were shown in Sections 3.B and 3.C. In this section, we will give more detailed numerical results.

The full numerical fit results for which applicants received offers are shown in Table A-2. In this table, the fit odds ratios are reported as well as the standard error associated with that variable.[13] Significant variables are shown using asterisks. For factors where $p \leq 0.05$, a single asterisk is used, while if $p \leq 0.01$, two asterisks are used.

[13] Note that the standard error is the error in the underlying fit coefficient, not the error in the odds ratio. In other words, it is the error in the log of the odds ratio.

Table A-2. Full numerical regression results for offer analysis. Cells give odds ratio value followed by standard error in parentheses. Significant values are shown with asterisks (* for $p \leq 0.05$, ** for $p \leq 0.01$)

	MODEL							
	1		2		3		4	
Gender (Male)								
Female	1.14		1.23		1.25		1.28	*
	(0.11)		(0.12)		(0.12)		(0.12)	
Nonbinary or did not wish to respond	0.95		1.06		1.06		1.07	
	(0.24)		(0.24)		(0.24)		(0.24)	
Race & Ethnicity (White)								
Hispanic or Latino	0.68	**	0.71	*	0.7	*	0.68	*
	(0.15)		(0.15)		(0.15)		(0.15)	
Asian	1.16		1.03		1.05		0.98	
	(0.14)		(0.15)		(0.15)		(0.15)	
Black or African American	0.55	**	0.57	**	0.65	*	0.57	*
	(0.21)		(0.21)		(0.21)		(0.22)	
Multiracial or Other	0.69		0.68		0.67		0.68	
	(0.2)		(0.2)		(0.2)		(0.21)	
Did Not Respond	1		0.95		1.07		1.04	
	(0.27)		(0.28)		(0.28)		(0.28)	
Academic Level (Freshmen or Sophomore)								
Junior or Senior	1.48	**	1.55	**	1.42	**	1.29	*
	(0.11)		(0.11)		(0.12)		(0.12)	
Graduate	2.69	**	2.71	**	2.86	**	2.63	**
	(0.17)		(0.18)		(0.19)		(0.19)	
Disability (Does Not Have a Disability)								
Has a Disability	0.89		0.89		0.93		0.95	
	(0.24)		(0.24)		(0.25)		(0.25)	
Did Not Respond	1.17		1.09		1.03		1.02	
	(0.25)		(0.25)		(0.25)		(0.26)	
Academic Major (Other Majors)								
Biosciences	-		0.83		0.87		0.83	
	-		(0.25)		(0.26)		(0.26)	
Computer and Information Science	-		1.83	**	1.91	**	1.83	**
	-		(0.19)		(0.19)		(0.19)	
Engineering	-		1.15		1.21		1.16	
	-		(0.17)		(0.18)		(0.18)	

	MODEL							
	1		**2**		**3**		**4**	
Physical Sciences	-		1.67	*	1.63	*	1.59	
	-		(0.23)		(0.23)		(0.24)	
School Classification (R1 School)								
Not R1 School	-		0.61	**	0.6	**	0.6	**
	-		(0.1)		(0.11)		(0.11)	
Academic Performance								
GPA	-		-		1.25	**	1.24	**
	-		-		(0.05)		(0.05)	
NREIP Familiarity (No Prior NREIP Experience)								
Has Prior NREIP Experience	-		-		-		2.74	**
	-		-		-		(0.16)	
(Intercept)	0.72	**	0.68		0.34	**	0.33	**
	(0.1)		(0.19)		(0.24)		(0.24)	
N	***1,688***		***1,688***		***1,650***		***1,650***	
Fit Diagnostics								
AUC	0.60		0.67		0.65		0.68	
McFadden's R	0.03		0.04		0.05		0.07	

IDA ran four models for each outcome variable. These four models incorporated different subsets of independent variables. Each of the four columns in the table corresponds to one of these models. Each model adds new independent variables to the fit. The first model includes only the demographic variables including gender, race/ethnicity, disability, and academic level. The second model adds the academic major and school classification, the third model adds academic performance (GPA), and the final model adds whether or not the applicants were prior NREIP interns.

From the results in the table, it is clear the significant variables are fairly stable, with two exceptions. The first is that identifying as female is only significant once all other variables are added. This indicates that there is some association between gender and academic major, school classification, GPA, and/or prior NREIP participation in terms of who is getting offers. For example, it is well known that female students are not as well represented in certain academic majors (National Center for Science and Engineering Statistics (NCSES) 2023). It is possible that the association with major is confounding the association with gender in model 1 to make the female category less significant than it is in the final model.

The second variable that changes in significance is Physical Sciences academic major. Specifically, adding in prior NREIP participation gets rid of the significance of the association between a Physical Sciences major and getting an offer. Looking in more details at the p-values, the results show that the p-values for Physical Sciences are always near the threshold, and they cross it between model 3 ($p = 0.038$) and model 4 ($p = 0.050$). So, the results are showing that there is some overlap in how prior NREIP participation and a Physical Sciences major are impacting the offer likelihood, but the change in significance is also a result of the specific choice of significance level. Overall, the models are fairly robust and the final model 4 is the one reported in Section 3.B.

This table also includes the number of applicants used in each model. There is a decrease from 1688 to 1650 when GPA is introduced because 38 applicants had to be removed from the model because they had unknown GPAs. Two goodness-of-fit tests are included as well. The AUC row gives the Area Under the Curve (AUC) for the Receiver Operating Characteristic (ROC) curve from the analysis. The AUC would be 0.5 if the model had no predictive value and would be 1.0 if the model perfectly predicted who got an offer. The AUCs for these models get as high as 0.68, which indicates some predictive power. An additional test is McFadden's Pseudo R-Squared. Typically, values above 0.2 indicate a good fit. In these models, the highest value achieved is 0.07. Both goodness-of-fit metrics show improved performance from model 1 to 4, which indicates that adding each subsequent independent variable is improving the fit of the model. Overall, the takeaway is that these models have some predictive power, but should not be considered good fits that can truly predict who would and would not get an offer.

IDA also performed GVIF tests to measure for possible multicollinearity between the independent variables. The largest GVIF value found (appropriately normalized for the number of degrees of freedom) was 1.05, indicating that all of the variables were sufficiently independent.

The full numerical results for the participation analysis are shown in Table A-3. It follows the same format as Table A-2.

Table A-3. Full numerical regression results for participation analysis. Cells give odds ratio value followed by standard error in parentheses. Significant values are highlighted using asterisks (* for $p \leq 0.05$, ** for $p \leq 0.01$)

	MODEL			
	1	**2**	**3**	**4**
Gender (Male)				
Female	0.77	0.67 *	0.64 *	0.64 *
	(0.17)	(0.18)	(0.19)	(0.19)
Nonbinary or did not wish to respond	0.75	0.75	0.75	0.75
	(0.39)	(0.4)	(0.41)	(0.41)

	MODEL							
	1		2		3		4	
Race & Ethnicity (White)								
Hispanic or Latino	0.65		0.69		0.61	*	0.6	*
	(0.23)		(0.24)		(0.25)		(0.25)	
Asian	0.71		0.84		0.83		0.79	
	(0.21)		(0.22)		(0.22)		(0.22)	
Black or African American	0.77		0.75		0.64		0.6	
	(0.35)		(0.35)		(0.36)		(0.37)	
Multiracial or Other	1.97		1.93		1.79		1.83	
	(0.4)		(0.41)		(0.41)		(0.41)	
Did Not Respond	1.05		1.14		1.01		1	
	(0.44)		(0.45)		(0.46)		(0.46)	
Academic Level (Freshmen or Sophomore)								
Junior or Senior	0.54	**	0.51	**	0.59	*	0.55	**
	(0.19)		(0.2)		(0.2)		(0.21)	
Graduate	0.54	*	0.46	**	0.47	**	0.45	**
	(0.25)		(0.26)		(0.27)		(0.27)	
Disability (Does Not Have a Disability)								
Has a Disability	1.63		1.69		1.68		1.72	
	(0.44)		(0.45)		(0.45)		(0.45)	
Did Not Respond	0.98		0.97		1.16		1.15	
	(0.39)		(0.4)		(0.42)		(0.42)	
Academic Major (Other Majors)								
Biosciences	-		1.08		0.94		0.94	
	-		(0.44)		(0.46)		(0.46)	
Computer and Information Science	-		0.46	*	0.42	**	0.42	**
	-		(0.31)		(0.32)		(0.32)	
Engineering	-		0.72		0.67		0.67	
	-		(0.29)		(0.3)		(0.3)	
Physical Sciences	-		1.95		1.84		1.87	
	-		(0.42)		(0.43)		(0.43)	
School Classification (R1 School)								
Not R1 School	-		1.38		1.47	*	1.49	*
	-		(0.17)		(0.18)		(0.18)	
Academic Performance								
GPA	-		-		0.75	**	0.75	**
	-		-		(0.09)		(0.09)	
NREIP Familiarity								
Has Prior NREIP Experience	-		-		-		1.49	

	MODEL			
	1	**2**	**3**	**4**
	-	-	-	(0.21)
(Intercept)	4.71 **	6.08 **	15.53 **	15.44 **
	(0.19)	(0.33)	(0.46)	(0.46)
N	***814***	***814***	***793***	***793***
Fit Diagnostics				
AUC	0.61	0.66	0.68	0.68
McFadden's R	0.03	0.05	0.06	0.07

Once again, the results are fairly robust across the models. Only three variables show changes in significance across the models. Identifying as female is only significant once academic major is included in the model. This indicates that the association between major and which offerees become interns was washing out some of the association between gender and participation. By including major as a separate variable, these associations can be separately understood.

Additionally, identifying as Hispanic or Latino is only significant once GPA is included. Similarly, the results for school classification are only significant once GPA is added. This indicates that in the early models, some of the impact from GPA was confounding the impacts from race/ethnicity and school classification. Overall, the models are fairly robust and the final model 4 is the one reported in Section 3.C.

The number of offerees in each model is also given in the table. It moves from 814 offerees for Models 1 and 2 to 793 offerees for Models 3 and 4 as 21 of the offerees had unknown GPAs. The measures of goodness-of-fit in this case indicate that this model is not a very good fit. The AUC maximum is 0.68, which is better than random, but is not near the AUC value of 1.0 that would indicate an excellent fit. The McFadden's Pseudo R-squared is 0.07 for the final model, which is far short of the desired value of 0.2. Both goodness-of-fit metrics do improve from Model 1 through Model 4, indicating that the extra independent variables are increasing the fit power. However, as discussed in Section 3.C, there are almost certainly other variables that are important in the participation decision. The largest GVIF measured across these models (adjusted for the number of degrees of freedom) was 1.08, indicating that multicollinearity was not an issue.

Ultimately, these results combine to give some insights on which variables are associated with higher and lower likelihoods of getting offers or becoming NREIP interns. Additionally, the model variations shown in this section give confidence that the models are robust to the additions of extra variables. However, these detailed numerical results also highlight that the models are not perfect fits and do not fully predict the outcome variables based on the independent variables.

Qualitative Interview Analysis

IDA conducted a program evaluation of NREIP to understand what interns gain from participating in the program and how it may be improved for future cohorts. To help answer these questions, qualitative methods were selected to facilitate the collection of rich, first-hand information about interns' experiences. Semi-structured interviews present a strength in that they allow researchers to pose pre-determined questions about topics known to be of interest, but also allow discovery of new ideas and topics as the interview unfolds. IDA interviewed 37 interns from the 2023 cohort in this manner.

Instrumentation

IDA developed an Interview Guide that contained an interview protocol, a structured ranking question, and a set of demographic questions. The Interview Guide was organized into five sections that were ordered to first get an understanding of interns' time within the program before turning to reflections on impacts and issues.

- **Warm-Up**: a series of short answer questions that are easy to address while also providing grounding information that frames the rest of the conversation. Warm-ups allow respondents to ease into the conversation before requiring them to think about deeper and more complex questions. For this study, the Warm-up was used to collect information on interns' start- and end-dates, site location, frequency of on-site presence, and prior participation in any internship programs.
- **Program Activities**: a series of interview questions designed to capture information about interns' day-to-day activities and interactions. Given the number of sites that NREIP covers, as well as the diversity of projects and mentors that interns can be paired with, these questions were vital in granting insight into the variance of the NREIP experience. Respondents were asked about their tasks and responsibilities, meetings with their mentor, and interactions with other interns.
- **Impacts**: a series of interview questions designed to elicit reflections on how the overall NREIP experience contributed to intern gains. For this section, respondents were asked to rank pre-determined areas of gains (STEM development, general professional development, social/professional network) based on where they felt they experienced the most significant improvement. Respondents were also given the chance to bring up any other topics that did not fit into these areas and incorporate them into the rankings. The ranking question was followed up by inquiring into the aspects of the NREIP experience that facilitated or hindered their gains, as well as how the respondents see their time in NREIP impacting their near-term future.

- **DEIA**: given the program's special interest in the topics of diversity, equity, inclusion, and access, a series of questions was implemented to gather accounts of interns' perspectives. Respondents were asked about any elements present in the program that helped enable their participation, such as assistance with housing, transportation, or stipends, in addition to being asked about ways in which program support could be expanded to better enable participation. Finally, questions were posed to understand interns' feelings of being included, valued, and supported while in their work environment.
- **Demographic Questions**: a short set of demographic questions were employed to capture factors that may condition their experience within the internship, including gender, race, and ethnicity, and type of degree being pursued.

To protect respondents' agency over their information, all questions were optional. Before beginning the interview, respondents were reminded of their right to pass on any question or end the interview prematurely.

Population and Sampling

The target population included interns in the 2023 cohort of NREIP who were 18 years or older. Since the evaluation constituted a foundational effort on NREIP, IDA determined that it would be more advantageous to engage a broad and varied sample of interns, rather than focus on interns at one or two sites. Since NREIP is administered in a decentralized manner, with the 2023 intern cohort spread across 45 sites, IDA also decided to construct the sample in a way that accounted for contextual factors that could impact how interns experienced the programming.

The application dataset revealed that sites varied considerably with respect to how many interns they were hosting in 2023. The median number of interns per site was 7, but the range was quite substantial, with sites hosting between 1 and 87 interns. Since it is possible for an intern's experience of NREIP to vary depending upon how many other interns are also participating at the same site, IDA constructed the first sampling stratum by program size. Sites were categorized as "small" or "large" depending on whether they had more or fewer interns than the median. There were 23 sites categorized as "small" (1 to 7 interns) whereas the remaining 22 sites were categorized as large (8 or more interns).

The application dataset also revealed that both undergraduate and graduate students could be present at any given NREIP site. Since it is possible for work expectations and peer dynamics to vary between undergraduate and graduate students, IDA constructed a second stratum by academic level. Based on these two contextual factors—size and academic level—IDA constructed the sampling frame illustrated in

Table A-4. Sampling Frame for Interviews (Number of Interns Available per Stratum)

	Small Sites	Large Sites	Total
Undergraduate Students	99	395	494
Graduate Students	5	81	86
Total	104	476	580

Note: Sites categorized as "small" if they had up to seven interns from any academic level. Sites categorized as "large" if they had eight or more interns from any academic level. One undergraduate student did not have a site identified and was not included in the interview sampling.

The study sample was to include approximately 40 interns, with 10 interns randomly chosen from each of the four cells in Table A-4. However, the sampling frame revealed that undergraduate and graduate students were not evenly distributed across program sizes. As such, IDA adjusted the sampling strategy to randomly select the following for invitation to the study: 10 undergraduates from small sites, 10 undergraduates from large sites, all 5 graduate students from small sites, and the remaining 15 graduate students from large sites.

Since participation in interviews was voluntary, the resulting sample differed slightly from the sampling plan. Information about the number of invitees and respondents is illustrated in Table A-5.

Table A-5. Comparison between the Number of Interns who Participated in Interviews and the Number of Interns who were Invited for Interviews (number of invitees in parentheses)

	Small Sites	Large Sites	Total
Undergraduate Students	10 (22)	14 (25)	24 (47)
Graduate Students	5 (5)	8 (39)	13 (44)
Total	15 (27)	22 (64)	37 (91)

Note: Sites categorized as "small" if they had up to seven interns from any academic level. Sites categorized as "large" if they had eight or more interns from any academic level.

Collection Procedures

Lab-Intern Coordinators for sites participating in NREIP in 2023 were sent a study flyer to forward to their respective interns. The flyer let interns know that IDA was hired to complete a program evaluation, described IDA's role as an independent entity, and then informed them that they may be invited to participate in a qualitative interview which should last no longer than 30 minutes.

After a potential subject was invited to the study, their name on the recruitment list was marked "invited" so that the IDA team did not accidently contact someone more than once regarding participation in the study. The IDA project team invited potential subjects

to the study using a pre-set recruitment package that included a description of the research, next steps, and information on whom to contact should there be any questions.

Interview sessions were conducted over ZoomGov, using the secure accounts provided to all IDA employees. ZoomGov offers functionality for potential to participate using a free copy of the regular Zoom application, by using a browser, or by dialing in via telephone. A passcode was required to join the meeting, and respondents were re-named as "Guest" when entering the Zoom session so that they could remain anonymous on any potential audio recordings. Respondents were also advised prior to proceeding with the interview that they should not identify themselves or others directly at any time during the interview. When using the Zoom application, they had the choice of participating with video or with audio only. IDA analysts conducted all interviews from a private location, taking care to ensure that no other individuals were able to overhear. Respondents were also encouraged to join the Interview Meeting from a private location.

Before beginning the study interview, the IDA team member conducting the session (the "collector") read the Research Statement, verbatim, to the potential respondent, answered any potential questions, and then verbally collected the potential respondent's decisions regarding: (1) whether to enroll in the study, and (2) whether the collector may record the audio of the interview meeting. This was done in order to avoid collecting a signed Informed Consent Form, which would be a record linking the subject to the research. The purpose of the audio recording was to ensure data quality, since it would be difficult for the collector to accurately and completely capture what respondents shared by taking notes while simultaneously conducting the interview. If respondents consented to participate in the interview but did not consent to the audio recording, the research team took notes during the interview session.

Interviews lasted approximately 30 minutes. At the end of the interview session, the collector thanked the respondent for participating and extended an open invitation to contact the IDA project team at any time should they have any additional questions or concerns about the study. While a thank you note is typically sent out the day following a respondent's participation, in this case such an acknowledgment would risk identifying one's participation in the study. In its place, respondents were thanked for their participation at the conclusion of the interview.

Data Processing

Given that it is not possible to control what is shared during interviews, as a respondent may accidentally state their name or another piece of personally identifiable information (PII) while telling a story, all original audio files were encrypted while at rest on IDA's unclassified networked servers. Also, only IDA personnel located in the continental United States of America (CONUS) were permitted to access original audio.

NVivo 10, the qualitative data analysis software that IDA employs, requires written transcripts for the analysis. As such, IDA first converted all audio files into written transcripts using the Speech-to-Text Tool on Amazon Web Services (AWS). The Speech-to-Text Tool was selected because it meets the DoD security requirement of being FedRAMP certified at the moderate level or higher.

After converting the audio files into raw transcripts, human analysts located in CONUS corrected them for accuracy. Analysts were instructed to focus on the content of what was said, by correcting misidentified words and acronyms, and to ignore errors in filler words (e.g., "um," "ah"). Analysts were also invited to add any other sounds (e.g., the pounding of a fist on a table) in brackets if the sounds communicated additional information worth considering in the analysis. Lastly, analysts were instructed to redact any information that: (a) could be used to easily identify someone (e.g., if a respondent accidentally stated a name during the interview), or (b) that the respondent requested IDA strike from the record.

Once the above had been completed, transcripts were considered to have been "de-identified." De-identified transcripts were stored, unencrypted, in a folder only accessible to the team on one of IDA's networked servers. IDA team members both in CONUS, as well as overseas, were able to access de-identified transcripts.

Analysis Procedures

With interview transcripts scrubbed and corrected, the IDA project team assembled transcripts into a corpus containing a total of 256 pages. The analysis then proceeded in multiple stages. First, the research team drew upon existing research and background knowledge about NREIP to develop an initial set of codes that could be used to organize interns' accounts of their experiences in NREIP and what they may have gained from the program. The initial code set was revised and expanded upon with additional sub-codes to capture variation in interns' perspectives and other nuances.

After coding the full corpus, IDA organized data into themes, based on the types of impacts that interns associated with their time in NREIP. Data within each theme were then further organized based on the specific impacts that interns identified, the factors that interns identified as helping to facilitate those impacts, and the challenges that interns raised with respect to obtaining these impacts from the program.

Exit Survey Analysis

This appendix includes descriptions of the methods used to analyze the Likert-style questions in the NREIP Exit Survey. In order to approach the Likert responses

analytically,[14] IDA first converted the columns from text answers to numerical responses on a scale from 1–5, as shown in Table A-6.

Table A-6. Scale Used to Convert Likert Responses to Numbers

Likert Response	Numerical Value
Strongly Disagree	1
Disagree	2
No Opinion	3
Agree	4
Strongly Agree	5

Once the Likert columns were numericized, IDA tried several approaches to check whether there were statistically significant differences across interns in how they answered the exit survey. None of the approaches yielded statistically robust results, potentially due to the small sample size (n=251). Consequently, IDA chose to focus on relaying exit survey findings by providing simple statistics, such as the mean, median, and mode, as reported in Section 4.D, Table 9.

IDA also considered whether there were meaningful differences within and across respondents in how they answered questions. In order to explore whether interns were, for example, more in agreement with one statement about NREIP over others, IDA employed mean-centering techniques. Individual mean-centering emerges from the recognition that people may vary in how they use Likert scales. For example, some people may use the entire scale (i.e., 1 to 5) whereas others may restrict their answers to part of the scale (e.g., 3 to 5). Mean-centering essentially provides a way to standardize how respondents addressed all of the statements about NREIP on the exit survey.

In order to do the individual mean-centering, IDA first calculated each person's unique mean (average) score using their responses to all nine statement questions. Mathematically, this can be written as,

[14] There is much discussion in the literature about how numerical Likert data should be treated. Most numerical tests on Likert data can be robust even if the underlying data do not truly satisfy the statistical assumptions of the test (see Norman 2010). IDA's final analysis involves simple comparisons that should be robust.

$$\widehat{r_j} = \frac{1}{9}\sum_{\alpha=1}^{9} r_{\alpha j} \ ,$$

Where, $r_{\alpha j}$ is the numerical response of respondent *j* to question α. The sum runs over the different questions (1 through 9), and $\widehat{r_j}$ gives the average response for respondent *j*. Across the Exit Survey sample, the maximum mean score that any individual held was 5, while the minimum mean score was 1.56.

Each person's unique mean is then used to convert all of their original scores into calculated deviations (e.g., if the person's mean was 4, then their original score of 3 would be transformed into 4-3=1). Or, more formally, IDA subtracted the mean from each response, for respondent *j,* to get that respondent's individual mean-centered scores (deviations). Mathematically this is given by

$$q_{\alpha j} = r_{\alpha j} \ - \ \widehat{r_j},$$

where $q_{\alpha j}$ is now the individual mean-centered response of respondent *j* to question α.

Individual mean-centering provides a better understanding of how respondents reacted to specific questions on the exit survey, regardless of how much of the Likert scale they used, which is useful in this case since so many of the original scores gravitated toward the positive end of the Likert scale. If the original scores were taken at face value, the positive bias would easily lead to the conclusion that there is no room for growth. By looking at mean-centered scores, IDA was able to see which statements, if any, received comparatively lower levels of agreement from interns. For example, if a respondent answered "Agree" for one statement about NREIP and "Strongly Agree" for all of the other statements, the relatively muted level of agreement with the first statement would be revealed. Even though "Agree" is still considered a positive reaction, it is still noteworthy that it was comparatively less positive than all of their other reactions.

When these subtle deviations across the full sample are examined, it becomes possible to identify areas where NREIP may be improved. To do this, IDA averaged the converted scores for each statement across all respondents. The average mean-centered scores for each statement are summarized in Table A-7.

Table A-7. Summary of Individually Mean-Centered Responses

Question	Mean (Standard Deviation)	Significance
1. Consider doing defense-related work	-0.037 (0.572)	
2. Received core skills training	0.003 (0.544)	
3. Related to career goals	0.043 (0.535)	
4. Navy career insight	0.210 (0.495)	**
5. Opportunities to attend lectures	0.011 (0.679)	
6. Started work in reasonable time	-0.180 (0.790)	**
7. Increased knowledge of DoD STEM Opportunities	-0.184 (0.710)	**
8. Would recommend to friend	0.107 (0.422)	**
9. Overall satisfaction	0.027 (0.421)	
Average mean-centered score across all nine statements	0 (0.598)	-

Note: Mean column gives the mean of individually mean-centered responses across all respondents for each statement in the exit survey. The numbers in parentheses provide the standard deviation for each mean across all respondents. The significance column indicates which statements had means that were statistically different from zero in a two-sided t-test (** $p< 0.01$, * $p< 0.05$). Every statement was addressed by 251 respondents.

The means summarized in Table A-7 indicate whether the full sample of respondents tended to reply to any of the statements more positively or more negatively, relative to their own personal averages. For example, results suggest that respondents expressed comparatively less agreement with a statement about starting work in reasonable time (-0.18) than a statement about developing "Navy career insight" (0.21) through NREIP.

To formalize these comparisons, IDA also performed a two-tailed *t*-test for each statement to check whether any of the means were statistically significantly different from 0. A mean further from 0, whether positively or negatively, suggests that interns reacted to the corresponding statement differently from how they reacted to the statements in general. Results indicate that two of the statements about NREIP received significantly lower levels of agreement from interns: starting work in a reasonable amount of time (-0.18, $p<0.01$) and increasing their knowledge of other DoD STEM opportunities (-0.18, $p<0.01$). On the positive side, interns expressed significantly more agreement with the statement that they

gained Navy career insight (0.21, $p<0.01$) and the statement about recommending NREIP to a friend or colleague (0.11, $p<0.01$).

Overall, the analytic results from using individual mean-centered scores to test interns' responses to statements about NREIP are consistent with what IDA found by analyzing unstandardized Likert scores (as reported in Section 4.E).

Appendix B.
Original Collection Instruments

Site Inventory

Opening Remarks

The Institute for Defense Analyses (IDA) has been invited by the Department of the Navy to do a study on the Naval Research Enterprise Internship Program (NREIP). To learn more about the features of each laboratory site that contributes to NREIP, IDA has put together a short (~15 minutes), online questionnaire.

Instructions*: Please complete the following Site Inventory to the best of your ability by March 31, 2023. All answers should be focused on your specific "site" (e.g., NRL Naval Research Laboratory in Monterey, CA), since the purpose of this form is to understand the unique combination of features at each individual location. If you are filling this out using the offline version, you may select items by highlighting, **bolding**, or marking an "X" next to your choice.*

Thank you, in advance, for your time!

In case we have clarification questions, may we ask who is filling out this form?

○ First Name _____

○ Last Name _____

○ Email Address _____

Please select your NREIP lab "site."

- ○ AFRRI Armed Forces Radiobiology Research Institute (Bethesda, MD)
- ○ CNMOC U.S. Naval Meteorological and Oceanography Command (Stennis Space Center, MS)
- ○ DEOMI Defense Equal Opportunity Management Institute (Patrick Space Force Base, FL)
- ○ FRCE Naval Air Systems Command Fleet Readiness Center East (Cherry Point, NC)
- ○ FRCSE Naval Air Systems Command Fleet Readiness Center Southeast (Jacksonville, FL)
- ○ FRCSW Naval Air Systems Command Fleet Readiness Center Southwest (North Island, CA)
- ○ MCTSSA Marine Corps Tactical Systems Support Activity (Camp Pendleton, CA)
- ○ MCWL Marine Corps Warfighting Laboratory (Quantico, VA)
- ○ NAMRU Dayton Naval Medical Research Unit (Dayton, OH)
- ○ NAMRU San Antonio Naval Medical Research Unit (San Antonio, TX)
- ○ NAVFAC Naval Facilities Engineering Command (Port Hueneme, CA)
- ○ NAWCAD Naval Air Warfare Center Aircraft Division (Patuxent River, MD)
- ○ NAWCAD Naval Air Warfare Center Aircraft Systems (Lakehurst, NJ)
- ○ NAWCTSD Naval Air Warfare Center Training Systems Division (Orlando, FL)
- ○ NAWCWD Naval Air Warfare Center Weapons Division (China Lake, CA)
- ○ NAWCWD Naval Air Warfare Center Weapons Division (Point Mugu, CA)

- ○ NEPMU5 Comprehensive Industrial Hygiene Laboratory at the Navy Environmental and Preventive Medicine Unit 5 (San Diego, CA)
- ○ NHHC Naval History and Heritage Command Underwater Archaeology Branch (Washington, DC)
- ○ NIWC Atlantic Naval Information Warfare Center Atlantic (Charleston, SC)
- ○ NIWC Atlantic Naval Information Warfare Center Atlantic Hampton Roads (Norfolk, VA)
- ○ NIWC Atlantic Naval Information Warfare Center Atlantic (New Orleans, LA)
- ○ NIWC Pacific Naval Information Warfare Center Pacific (Guam)
- ○ NIWC Pacific Naval Information Warfare Center Pacific (Honolulu, HI)
- ○ NIWC Pacific Naval Information Warfare Center Pacific (Philadelphia, PA)
- ○ NIWC Pacific Naval Information Warfare Center Pacific (San Diego, CA)
- ○ NMRC Navy Medical Research Center (Frederick, MD)
- ○ NMRC Navy Medical Research Center (Silver Spring, MD)
- ○ NPS Naval Postgraduate School (Monterey, CA)
- ○ NRL Naval Research Laboratory (Stennis Space Center, MS)
- ○ NRL Naval Research Laboratory (Monterey, CA)
- ○ NRL Naval Research Laboratory (Washington, DC)
- ○ NSMRL Naval Submarine Medical Research Laboratory (Groton, CT)
- ○ NSWC Carderock Combatant Craft Division Norfolk Detatchment (Norfolk, VA)
- ○ NSWC Carderock Naval Surface Warfare Center Carderock (Bethesda, MD)

- ○ NSWC Corona Naval Surface Warfare Center Corona (Corona, CA)
- ○ NSWC Corona Range Systems Department, Expeditionary Systems Evaluation Division (Fallbrook, CA)
- ○ NSWC Crane Naval Surface Warfare Center Crane (Crane, IN)
- ○ NSWC Dahlgren Combat Direction Systems Activity Dam Neck (Virginia Beach, VA)
- ○ NSWC Dahlgren Naval Surface Warfare Center Dahlgren (Dahlgren, VA)
- ○ NSWC Indian Head Naval Surface Warfare Center Indian Head (Indian Head, MD)
- ○ NSWC Panama City Naval Surface Warfare Center Panama City (Panama City, FL)
- ○ NSWC Philadelphia Naval Surface Warfare Center Philadelphia (Philadelphia, PA)
- ○ NSWC Port Hueneme Naval Surface Warfare Center Port Hueneme Division (Port Hueneme, CA)
- ○ NUWC Keyport Detachment Pearl Harbor Naval Undersea Warfare Center Keyport Detachment Pacific (Pearl Harbor, HI)
- ○ NUWC Keyport Naval Sea Logistics Center (Mechanicsburg, PA)
- ○ NUWC Keyport Naval Sea Logistics Center (Kittery, ME)
- ○ NUWC Keyport Naval Undersea Warfare Center Keyport (Keyport, WA)
- ○ NUWC Newport Naval Undersea Warfare Center Newport (Newport, RI)
- ○ PSNS/IMF Naval Sea Systems Command Puget Sound Naval Shipyard & Intermediate Maintenance Facility (Bremerton, WA)
- ○ USNO United States Naval Observatory (Washington, DC)
- ○ Other

In addition to NREIP, will your site be hosting summer interns from other programs (e.g., SEAP, SMART) in 2023?

Select one.

- ○ No
- ○ Yes
- ○ Don't know

In the past 12 months, how often did your site use each of the following advertising methods to help market NREIP to potential applicants?

Select one per row.

	Never	Rarely	Sometimes	Often	Don't know
Job posting website	○	○	○	○	○
NREIP's website	○	○	○	○	○
Other organization's website	○	○	○	○	○
Social media	○	○	○	○	○
University partners or contacts	○	○	○	○	○
Virtual job fairs or recruiting events	○	○	○	○	○
In-person job fairs or recruiting events	○	○	○	○	○
Conferences	○	○	○	○	○
Professional societies	○	○	○	○	○
NREIP alumni	○	○	○	○	○

Did your site use any other advertising methods?

Select one.

- ○ No
- ○ Don't know
- ○ Yes (please specify): _____

About how many NREIP mentors will your site have in 2023?

Please estimate to the best of your ability. If you do not have an estimate, you may input "999".

_____

What types of training or guidance, if any, will your site's new 2023 NREIP mentors receive on how to mentor interns?

Select all that apply.

- ☐ None
- ☐ Informal handout or other instructional material
- ☐ Group training session
- ☐ Informal guidance from previous mentors
- ☐ Other (please specify): _____

What types of work arrangements will be available to your site's 2023 NREIP interns?

Select all that apply.

☐ In-person all of the time

☐ Remote all of the time

☐ Hybrid (combination of remote and in-person)

To the best of your knowledge, what types of housing do the in-person interns at your site use while at NREIP?

Select all that apply.

☐ Program housing

☐ Summer sublet, rental, or other independent housing

☐ Stay with family or friends in the area

☐ Other (please specify): _____

About how many minutes does it take to walk from your site to the nearest public transportation available (e.g., bus stop, metro or rail station)?

If you do not know about public transportation in your area (e.g., because you drive to work), you can input your site's address into Google maps and use the "Transit" layer to help identify nearby locations.

_____

What types of professional development resources, if any, will your site provide to the 2023 NREIP interns?

Select all that apply.

- [ ] None
- [ ] Individual instruction
- [ ] Group instruction
- [ ] Information handout or other instructional material
- [ ] Seminars and guest speakers
- [ ] Other (please specify): _____

What types of topics, if any, will the professional development resources at your site cover?

Select all that apply.

- [ ] No professional development resources offered
- [ ] Science skills and knowledge areas
- [ ] Writing
- [ ] Presentation skills
- [ ] Networking
- [ ] Time management
- [ ] Resume building
- [ ] Other (please specify): _____

Approximately how many group social activities (e.g., field trip, potluck) will your site organize for the entire 2023 NREIP cohort at your location?

If your site does not normally organize social activities for interns, please input 0. If you do not have an estimate, you may input "999".

_____

How, if at all, will your site provide performance feedback to the 2023 NREIP interns?

Select all that apply.

☐ None provided

☐ Ongoing feedback throughout

☐ Interim performance evaluation meeting(s)

☐ Final performance evaluation meeting

☐ Other (please specify): _____

How, if at all, will your site collect feedback from the 2023 NREIP interns on how to improve the program?

Select all that apply.

☐ None collected

☐ Informally, as needed

☐ Structured evaluation (e.g., feedback form, exit interview)

☐ Other (please specify): _____

To the best of your knowledge, is your site tracking where NREIP alumni are hired after completing the program?

Select one.

- ○ No
- ○ Yes
- ○ Don't know

Does your site ever hire former NREIP interns upon graduation?

Select one.

- ○ No
- ○ Yes
- ○ Don't know

What types of employment mechanisms, if any, are currently available for your site to hire former NREIP interns, if desired?

Select all that apply.

☐ No employment mechanisms currently available for NREIP alumni

☐ Direct-Hire Authority (e.g., STRL, SSEP, Technical Positions, Defense Acquisition Workforce)

☐ Standard Competitive Service Appointment

☐ Non-competitive Service Appointment (e.g., disabled veteran, person with disabilities, military spouse)

☐ Through another government education/training program (e.g., Pathways, SMART, Recent Graduates Program)

☐ Don't know

☐ Other (please specify): _____

Can you briefly describe the main reason your site participates in NREIP?

_____

Thank you again for your time!

Interview Guide

Opening Remarks

Hello, I'm [Interviewer Name] and this is [Scribe Name]. We are with the Institute for Defense Analyses (or IDA). [Scribe First Name], I'd like to introduce you to our "Guest."

[To Guest] How are you doing today?

Before we begin, I'd like to share some background and discuss today's logistics. I will then pause to see if you have any questions.

Research Statement: IDA is conducting a study for the Department of the Navy to evaluate the Naval Research Enterprise Internship Program (NREIP). The purpose is to understand what people gain from NREIP and generate ideas for improvement. As part of the project, we are interviewing approximately 40 randomly chosen interns to hear about their experiences in the 2023 program.

If you agree to go forward with an interview, I will ask a series of questions about NREIP. The interview should take about 30 minutes. Our goal is to learn from a variety of perspectives, so there are no right or wrong answers. Also, all questions are optional, so it's ok if you don't know about something or prefer not to answer; just tell me and we will move on. You can end the interview at any time without penalty. I will not be asking about operationally-sensitive or classified information -- so please do not bring anything like that up during our conversation. Anything you share during the interview is confidential, with the exception that we are required by law to report any suspicion of harm to yourself or others to the appropriate authorities.

Information from interviews will be compiled and summarized into a report that IDA will deliver to the sponsoring office. The report will not contain names or other information that may be used to identify someone that participated. Further distribution of the report is at the sponsor's discretion.

With your permission, I would like to record the audio of our conversation. The purpose of the audio is so I can pay full attention to what you are saying, rather than trying to listen while simultaneously taking notes. At any moment, you may ask us to pause or end the audio recording. If you do not want to have the audio recorded, we will pause in between questions to take notes on your responses. Please note that this may increase the expected duration of the interview.

1. *Do you have any questions?*
2. *Would you like to proceed with the interview?*
3. *May I record the audio of our conversation for our internal purposes?*
    a. *[If yes:] Thank you [Scribe] for joining. [Scribe signs off.]*

i. ***Exception for Traveling IDA Collectors****: Scribe stays on, hits record, and fades into the background.*

b. *[If no:] Ok. In this case, [Scribe] will turn off their camera and take notes. If you need them at any point, just let me know and we can summon them back.*

4. *Do you have any time constraints I should know about?*

Interview Protocol

Notation Key

- *Transition language is in italics*. It is used to help the Respondent (R) shift between question sets that are potentially incongruous. Please read as written.
- Triangles (▲) denote questions that may be skipped in the event of a compressed timeline.
- [Follow-Ups] are conditionally required. They solicit additional but distinct information related to the umbrella question under which they are nested. Should only be posed if the umbrella question was either asked or if the R organically (i.e., without prompting) started discussing the umbrella question topic.
- [Probes] are backup questions. They solicit more detail on one or more aspects of the umbrella question under which they are nested. Should only be asked if the types of information they cover did not come up organically in response to the umbrella question.

Warm-up

The first set of questions help me get a sense of where you are in the program and what you have been up to this summer.

1. When did you start NREIP this year?
2. When is your last day?
3. At which site are you located?
4. Are you working on site, remotely, or hybrid?
    a. [Probe] How often are you working on site?
5. Is this your first time in an internship program?
    a. [If not] What did you do previously?

Program Activities

6. What kinds of tasks or responsibilities do you have on the project you're working on at NREIP?
7. Are there other interns at your site?

a. [Follow-up] how, if at all, do you interact with them while on the job?

b. [Follow-up] how, if at all, do you interact with them outside of work?

8. Can you describe your interactions with your mentor?

    a. [Probe] how often per week?

    b. [Probe] What, if anything, did you gain from working with this mentor?

    c. [Probe] Is there anything your mentor could have done differently that might have worked a little better for you this summer?

Impacts

The next few questions are about reflecting on the NREIP experience as a whole.

9. What people gain from internships can be very unique to the individual. How would you rank the following 3 areas in terms of where *you* made the most gains this summer? The choices are: (1) **STEM development** (improving your STEM skills or learning new knowledge areas), (2) **general professional development** (knowing what you want to do for a career, resume building, and soft skills like the ability to work on a team, deliver briefings, and so forth), or (3) **enhancing your social or professional network**? So, again, those are (1) STEM development, (2) general professional development, and (3) enhancing your social or professional network—let's rank them from where you gained the most to where you gained the least.

10. With respect to [top choice], can you describe what changed?

    a. [Probe:] What about NREIP helped make this change happen?

11. With respect to [bottom choice], what would you have wanted to gain more of in this area?

12. Of those 3 areas, which was the most important to you when starting this internship?

13. Is there anything else that you gained or learned from NREIP that we did not already cover?

14. Looking forward, how, if at all, will your time in NREIP impact any aspect of your life in the next few years, whether big or small?

DEIA

The next set of questions are about diversity, equity, inclusion, and access (or "DEIA"), since this is one of NREIP's goals.

15. One aspect of DEIA is accessibility; in other words, ensuring people have whatever they need to be able to come if they receive an offer. What types of benefits or

support, if any, did NREIP provide that helped make it easier for you to attend this summer?

a. [Probe] Was the stipend an important enabler for you?

b. [Probe] Did they offer any kind of housing support?

c. [Probe] Did they offer any kind of transportation support?

16. What, if anything, could be done to expand or enhance accessibility?

17. Another aspect of DEIA is ensuring people feel included, valued, and supported while at work, even if they come from a different social, economic, regional, or cultural background. How is NREIP doing in this regard?

18. What, if anything, could be done better?

Wrap Up

19. That's it for the main interview questions. Is there anything else we didn't cover that you feel is important for us to know or keep in mind when we do the analysis?

Demographics

To wrap up, I have a few demographic questions. We ask them so we can describe the types of people we interviewed on an aggregate level. As always, you can pass on anything you do not wish to answer.

20. How, if at all, would you like to identify your gender?

21. How, if at all, would you like to identify your race and ethnicity?

22. What type of educational degree will you be pursuing this fall?

Thank you again for taking time to meet with us. I know you're busy, so I especially appreciate it. [Adapt the thank you, as needed, to each particular R. The goal is for them to feel appreciated as they walk out the door.]

Appendix C.
Data Management Plan

IDA was granted access to a wealth of information by NREIP and its interns. With this in mind, IDA enacted procedures to ensure proper data stewardship. These procedures included treatment of Personal Identifiable Information (PII) within the NREIP application data as well as possibly sensitive information within the Intern Interviews. This appendix lays out the management procedures that were used to ensure information was treated properly.

The project's data management plan was reviewed by IDA's General Counsel and IDA's Chief Information Officer for adherence to standard data collection, storage, and security procedures.

Site Inventory Data

The Site Inventory collected data from Lab Coordinators and Program Managers that work for the DoN. The only piece of information about the respondents to the Site Inventory was their names and email addresses, so IDA could potentially contact them with any clarification questions if needed. Otherwise, all information collected was at the site level.

Data collected for the Site Inventory were stored and analyzed on IDA's unclassified networked servers, which are authorized up to the CUI level. Access to this network is granted to IDA employees using IDA's VPN capabilities and multi-factor authentication. Data were stored in folders that were only accessible to members of the team authorized by the principal investigator.

At the conclusion of IDA's work with NREIP, all copies of the Site Inventory data will be archived.

Application and Exit Survey Data

The NREIP application included PII about applicants, including their legal names, e-mail addresses, birthdays, home addresses, school names, and more. The sensitivity of these data required special storage and handling procedures.

All data were transmitted from NREIP to IDA using a DoD-approved and encrypted file-sharing system known as DoD Safe. After the sponsor posted an encrypted copy of the

application data to DoD Safe, IDA directly downloaded it to an independent and strongly secured server known as IDA-Atlas.

The IDA-Atlas server has extremely restricted access that is limited to approved team members and IDA technology administrators. The server is blocked off from connecting to any other IDA network and all of the internet, with the exception of DoD Safe and a site for updating installed software. Users were only allowed to access IDA-Atlas if they were physically located in the United States of America and using IDA's VPN tunnels. Activity on IDA-Atlas was routinely monitored by IDA's cyber team for any suspicious behavior.

All analyses involving NREIP application data were conducted on IDA-Atlas. After the analyses were completed on the PII server, it was necessary to transfer aggregated and de-identified findings to non-PII computers for inclusion in the final report. Exports were reviewed and approved by IDA's cybersecurity team on a case-by-case basis to ensure that no PII left the IDA-Atlas server.

At the conclusion of IDA's work with NREIP, all copies of the application data will be encrypted and archived.

Interview Data

IDA used data from the NREIP applications, located on the IDA-Atlas server, to create a stratified random sample of interns to invite to the interview study. A file containing the interview study sample was saved on IDA-Atlas where each potential respondent was assigned a numeric identifier which was used to mark all of their subsequent files (audio, fieldnotes, NVivo ID). A de-identified cross-walk of the sample file was generated and transferred to IDA's main network, which requires multi-factor authentication, and is stored in a folder only accessible to team members for internal record-keeping purposes. Select members of the IDA team sent invitation emails to the NREIP interns identified in the sample and coordinated a time to meet virtually with those who were interested in participating in the interview study.

As laid out in Appendix A, the intern interviews were conducted through ZoomGov and recorded by team members physically located in the United States of America onto their IDA computers. IDA referred to respondents as guests during the interviews so that no identifying information about those who chose to enroll in the interview study was stored in the interview recording. During the interviews, interns were not asked questions that probed PII information. Of course, it was impossible to control what respondents said, so the interview recordings were treated as Controlled Unclassified Information (CUI) and password protected to encrypt the files. IDA's network drives on the main network are authorized to hold CUI, so the procedures that IDA used to handle the interview data did not require use of the PII server. The encrypted audio files were moved to a folder only accessible to team members in a drive on IDA's network promptly after the interview. The

unencrypted version of each recording was then permanently deleted from the team member's IDA computer after the interview.

The next step in the process was to turn the encrypted audio recording into a transcript. This was done by briefly unencrypting the audio file to upload to an Amazon Web Services (AWS) S3 Bucket. From there, the file was passed to AWS Transcription services. All of the AWS work was done through AWS GovCloud, which is FedRamp compliant. Once complete, the interview transcript was downloaded and encrypted. All local unencrypted files and all files on AWS were deleted as soon as the encrypted transcript was created.

The final step of data management was having individual analysts clean the text transcripts. As described in Appendix A, the cleaning process involved making sure the transcript was readable for analysis. However, analysts also removed any potentially sensitive or identifying information. At that point, the transcript was no longer CUI, as it contained no sensitive information. A clean copy of each transcript was saved on IDA's network drives so analysis could begin.

At the conclusion of IDA's work with NREIP, all de-identified copies of the interview data will be archived.

Appendix D.
Software Used

Throughout this analysis, various software tools were essential.

R

All of the analysis of the application and exit survey data was done using the R programming language (R Core Team 2022). Beyond the basic R installation, the specific packages used in the analysis were:

- **tidyverse** to organize data in useful data structures and organize the analysis (Wickham 2022)
- **janitor** to create summary tables and clean input data (Firke 2021)
- **lubridate** to standardize storage of dates and times (Grolemund and Wickham 2011)
- **broom** to standardize storage of statistical test output (Robinson, Hayes and Couch 2022)
- **plm** to run fixed-effects models (Croissant and Millo 2008)
- **pwr** to run power analysis on statistical tests (Champely 2020)
- **naniar** to deal with missing values in the data (Tierney, et al. 2021)
- **usmap** (Lorenzo 2022) and **rgdal** (Bivand, Keitt and Rowlingson 2022) to create maps
- **car** to calculate GVIF (Fox, Weisberg and Price 2022)
- **pROC** to calculate AUC for ROC curves (Robin, Turck, et al. 2011)
- **pscl** to calculate Pseudo-R squared values (Jackman, et al. 2020)
- **likert** to plot results of Likert survey questions (Bryer and Speerschneider 2016)

NVivo

IDA used NVivo Version 10 for the interview analysis (Lumivero 2014). This software allowed for the tracking and coding of the interview corpus.

Illustrations

Figures

Tables

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Abbreviations

CAC	Common Access Card
CONUS	continental United States
DoD	Department of Defense
DoN	Department of the Navy
GPA	grade point average
IDA	Institute for Defense Analyses
NREIP	Naval Research Enterprise Internship Program
ONR	Office of Naval Research
PII	personally identifiable information
STEM	science, technology, engineering, and mathematics

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14. ABSTRACT

IDA conducted a multi-method evaluation of the Naval Research Enterprise Internship Program (NREIP), the flagship STEM program in the Department of the Navy. The evaluation included a statistical analysis of who applies to and accepts offers from NREIP, a mixed method analysis (interviews, statistics) of what interns believe they gain from the program, an original site-level survey to better understand NREIP's organizational features, and more.

15. SUBJECT TERMS

STEM education; program evaluation; Navy; Internship; science, technology, engineering, and mathematics

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