EVALUATION OF THE INTERNATIONAL RESEARCH EXPERIENCES FOR STUDENTS (IRES) PROGRAM:

Portfolio Analysis

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A report from the Evaluation and Assessment Capability Section of the National Science Foundation.

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About this report

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EVALUATION OF THE INTERNATIONAL RESEARCH EXPERIENCES FOR STUDENTS (IRES) PROGRAM – PORTFOLIO ANALYSIS

The National Science Foundation's (NSF) International Research Experiences for Students (IRES) program seeks to foster a diverse, globally engaged scientific workforce that operates at the cutting edge of knowledge production and contributes to the nation's global leadership and competitiveness. Managed by the Office of International Science and Education (OISE), IRES supports international research experiences for U.S. undergraduate and graduate students pursuing degrees in science or engineering. The IRES program has funded international research opportunities for approximately 5,000 students since its inception in 2006.

This report, the first from the formative evaluation of IRES being conducted by Mathematica, explores what the NSF-maintained program documents and data reveal about the program's progress toward its goals and objectives, as well as what remains to be learned. The analyses examined proposals submitted to and projects awarded through the Track I mechanism (IRES Sites)[1] to (1) understand the outcomes of the proposal review and award selection process, and (2) describe the program's portfolio of awards. The Summary of Approach box found on page 4 provides methodological details. Mathematica's analyses of existing data indicate the following:

- The IRES program is well aligned with OISE's mission of leveraging international collaborations to advance science. With its **focus** on international research experiences for both undergraduate and graduate students, the IRES program has a unique niche among NSF programs to develop globally competent U.S. scientists and engineers.
- The proposal review and selection process has resulted in a diverse set of awards that reflect the range of **proposals** submitted. Across all NSF-wide and IRES-specific criteria review panels more commonly identified strengths among awarded proposals than declined proposals. Yet limited resources may leave some meritorious proposals unfunded.
- The IRES program has supported 273 projects since 2006. Together these projects have provided student international research experiences spanning 77 **countries** across every continent except Antarctica, although locations in Europe and Asia are most common.
- The IRES 2006–2018 portfolio represents the full range of **disciplines** in NSF's larger research portfolio. However, engineering and the physical sciences, the most common disciplines involved in IRES have much greater representation among IRES projects than in the NSF-wide portfolio of investments. An analysis of proposals submitted in 2018 suggest that the share of projects in these disciplines reflects the larger share of proposals submitted, not a higher rate of acceptance.
- In alignment with the program's theory of change, projects support students' professional development through research and non-research **activities** at the international host site to help develop students' research skills and foster their international engagement. In addition, projects support students' professional development with activities in the United States, including pre-departure preparation or post-international research follow-on activities, such as dissemination of research findings. However, existing data sources contain sparse information about participant-level experiences and outcomes, suggesting the need for additional data collection.
- **Outputs** reported by 15 projects funded in the 2013 cohort commonly included publications (93 percent) and presentations (87 percent)). In terms of **outcomes**, all projects reported developing human resources (100 percent), and most reported contributions to advancing their disciplines (93 percent).
- This analysis provides some insight into the progress IRES has made towards its goals, but it also reveals gaps in what can be learned from existing sources. Thus, some **considerations** for ongoing and future evaluation activities and program monitoring include: expanding the monitoring of participant-level experiences and outcomes, and supplementing NSF reporting instructions with IRES-specific guidance.

The six sections of this report present (1) an overview of key findings from the literature on international research experiences, (2) a summary of the IRES program strategy, (3) a comparison of awarded and declined proposals, (4) a descriptive analysis of the portfolio of IRES awards, (5) a discussion of project implementation activities and outputs, and (6) a set of considerations for ongoing and future evaluation and program monitoring efforts.

1. LITERATURE ON INTERNATIONAL RESEARCH EXPERIENCES FOR STUDENTS

The literature on outcomes related to participating in international research provides limited evidence, but suggests impacts on intercultural preparedness, research productivity, and international collaborations.

Findings from four research studies that used a comparison group design suggest that these experiences contribute to important research-related outcomes for undergraduate students, graduate students, and postdoctoral researchers. We discuss these studies below.

One study compared undergraduate students who had participated in an international research experience with peers who participated in similar experiences in the United States and found significant differences in self-reported gains from the research experience. As expected, those participating in international research reported larger gains in their preparedness for international or cross-cultural engagement,[2] which includes both the ability to work in cross-cultural teams as well as a value placed on the good of science and engineering for a global, rather than just local, community.

Studies examining the experiences of graduate and postdoctoral participants in international research found impacts in other domains. On average, compared to their counterparts without the international research experience, participants produced significantly more publications,[3] more publications with foreign co-authors,[4] and publications with greater impact.[5] Participants were also significantly more likely to hold international postdoctoral appointments,[6] engage in activities to foster international collaborations,[7] and maintain their international collaborations.[8] The evidence suggests that the benefits graduate and postdoctoral participants attain from their time spent abroad do not come at the expense of educational or professional achievements. Participants and comparison group members were equally likely to obtain an advanced degree,[9] hold any postdoctoral appointment,[10] or hold similar faculty ranks.[11]

Other studies also document student-reported gains in knowledge and skills.

Descriptive studies, which are more common than comparative studies, contribute insights into students' assessments of the research experiences. Student-reported benefits include enhanced research knowledge and skills; personal growth in areas such as self-confidence, communication, and leadership skills;[12] improved cultural competencies;[13] enhanced professional networks;[14] increased foreign language proficiency;[15] influenced or solidified future education or career plans;[16] enhanced marketability of students;[17] and increased knowledge of research ethics.[18]

SUMMARY OF APPROACH

Review changes in the program's design over time by analyzing the solicitations released in 2004, 2012, and 2018 and interviewing two NSF staff members involved with the program.

Compare awarded and declined proposals based on the review criteria that panels are instructed to use to assess merit including NSF-wide and IRES-specific review criteria, which had been updated as recently as the 2018 solicitation. This comparative analysis explores the dimensions on which awarded and declined proposals differ, on average. It focuses on Track I proposals (N = 143) that responded to the 2018 solicitation and for which decisions had been made by December 2018. According to NSF, these were representative of proposals submitted in that year. The data come from proposals, panelist reviews, panel summaries and NSF review analysis documents.

Describe the portfolio of IRES awards through an analysis of the characteristics of all projects funded. This analysis summarizes NSF's investment in developing globally engaged researchers through IRES. The data used for this analysis come from NSF's FastLane system and include all Track I projects funded between 2006 and 2018 (N = 273).

Describe project activities through an analysis of information reported to NSF by projects funded in 2013 (N = 15), which are the most recent cohort of projects to have completed all years of funding. This in-depth analysis provides insight into the approaches used to recruit and select students; the activities and supports offered to students before, during, and after their international research experience; the problems projects encountered; and the outcomes reported by the projects. This analysis relies on data from proposals, annual and final reports, and supplementary materials.

2. IRES PROGRAM STRATEGY AND DESIGN

The IRES program endeavors to foster the nation's global leadership and competitiveness in scientific research by supporting international research and research-related activities for U.S. students pursuing undergraduate and graduate degrees in science or engineering.

The program is grounded in a theory of change for preparing internationally engaged scientists and engineers.

Exhibit 1 displays the logic model that undergirds the theory of change of how IRES can further the nation's global leadership in science and engineering. Several resource inputs are needed to implement the IRES program, key among which are three-year grants awarded to colleges, universities, and other organizations, such as research labs and professional societies. These grantees engage in activities to recruit and select participants, and create opportunities for them to participate in authentic research in international settings with mentorship from host researchers.

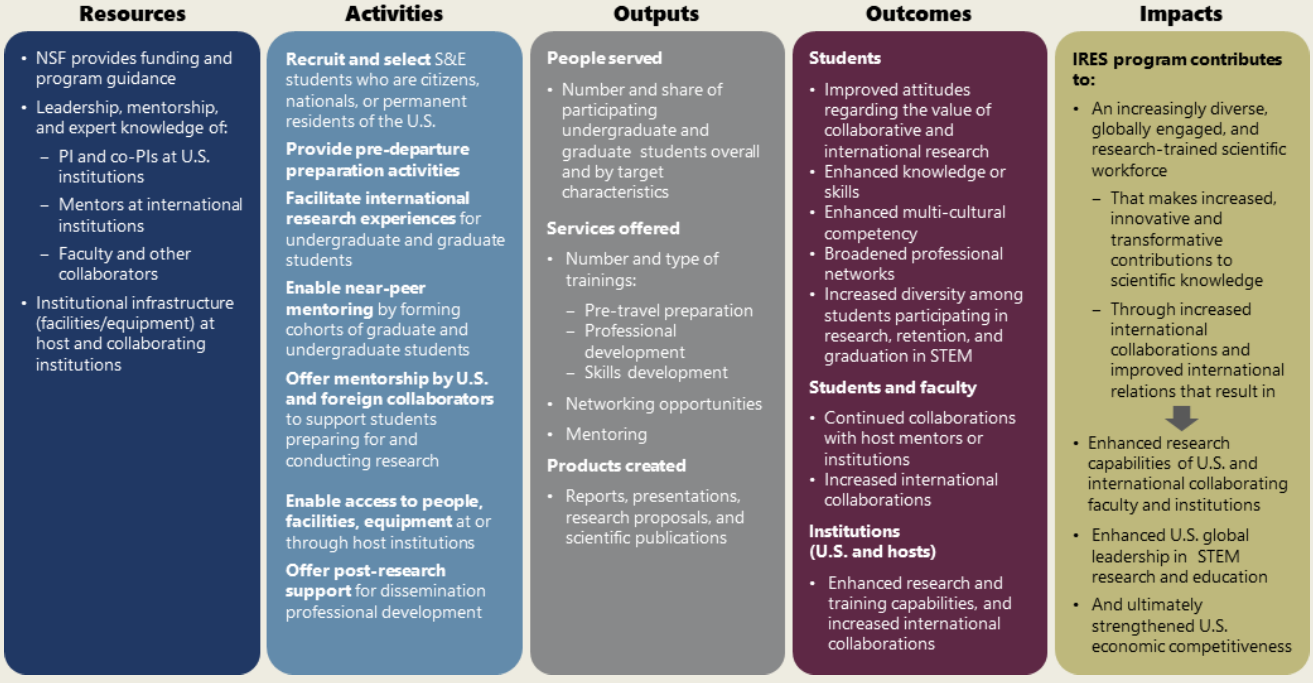
To prepare students for these research experiences, projects are expected to provide pre-departure training and support. Students participating in IRES might have opportunities to do field work (such as collecting data), analyze data, interact with others and expand their professional networks, and prepare technical reports, presentations, or scientific publications. These activities and outputs likely lead to key outcomes, such as improved attitudes and increased knowledge and skills, which may ultimately be linked with several subsequent outcomes. These include retention and graduation with undergraduate and graduate degrees in science, technology, engineering, and math (STEM) fields, entry into the STEM workforce, and contributions to the scholarly literatures of their fields. The program also hopes to strengthen institutional collaborations and enhance the research capabilities of collaborating institutions in the United States and abroad. This theory of change guides the analysis presented below, which seeks to study implementation of the components associated with these desired outcomes.

The goal of the IRES program has remained consistent since its inception, with some modifications to the structure of the program.

The program has maintained a focus on supporting international research and research-related activities for U.S. science and engineering students. The initial solicitation (NSF 04-036) allowed applications under two components: (1) IRES, which supported groups of students conducting research abroad, and (2) Doctoral Dissertation Enhancement Projects (DDEP), which supported a single doctoral student in conducting dissertation research abroad. The two subsequent solicitations (12-551 and 18-505) focused exclusively on the IRES program, and the latter expanded the types of projects that would be funded to three tracks:

- **Track I – IRES Sites.** Supports U.S. students' research at an international site with mentorship from host researchers.
- **Track II – Advanced Studies Institutes.** Supports U.S. graduate students in intensive short courses offered at an international location.
- **Track III – New Concepts in International Graduate Education.** Funds large-scale efforts to support U.S. graduate students in international research and professional development opportunities.

Exhibit 1. IRES Track I strategy for preparing internationally engaged scientists and engineers



PI = principal investigator; S&E =science and engineering; STEM = science, technology, engineering, and math.

Common throughout these solicitations was funding for projects that support groups of students, organized by a unifying theme, to conduct research abroad in collaboration with foreign investigators; these were designated Track 1 in the 2018 solicitation. Specific evaluation requirements evolved across the solicitations, with the 2018 solicitation requiring that a project's evaluation plan include the names of the student participants.

Over time, minor changes were made to the component of the program now known as Track I. Most notably, the maximum size of awards has increased from an initial $150,000 over a three-year period, to ceilings of $250,000 and $400,000, in 2012 and 2018, respectively. In addition, the allowable costs were expanded to include support for the principal investigator's salary.

IRES aligns with OISE's strategic priorities, promoting international science and engineering activities and helping to advance NSF's vision promoting the global leadership of the nation in research and innovation.

As international boundaries become less important in pursuing scientific endeavors and solving complex problems at the frontiers of science, preparing globally engaged scientists with world-class skills becomes increasingly important. IRES is unique in its focus on supporting active research in international settings for both undergraduate and graduate students, across all NSF-supported disciplinary fields and without limitations on the international locations. Although other programs that support student research experiences allow or highlight international research (for example, Research Experiences for Undergraduates, Graduate Research Fellowship Program), only a small share of these awards are used for international research. Other internationally focused NSF programs (for example, Partnerships for International Research and Education) provide fewer international opportunities for students.

With its capacity to develop undergraduate and graduate students, IRES has the potential to influence the next generation of researchers to be globally engaged and prepared to engage in international research. Thus, IRES has a role in advancing both NSF's commitment to promoting the progress of science through leadership in research and education, and OISE's specific commitment to international activities and partnerships to promote innovation in the United States.

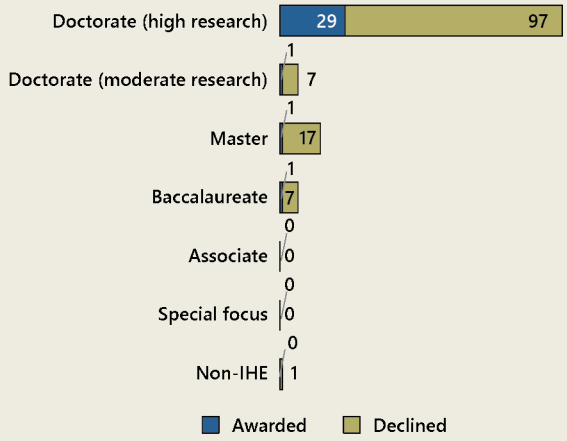
3. PROPOSAL REVIEW AND AWARD SELECTION (2018)

NSF's merit review process helps guide NSF's selection of IRES projects, and thus investments in the IRES portfolio. To understand differences between awarded and declined proposals, we compared proposals, panel review documents, and review analysis documents for 143 proposals submitted as part of the 2018 solicitation (more details in the Summary of Approach box). Twenty percent of these proposals (28 of 143) received awards.

Proposals were received primarily from, and awarded to, institutions of higher education that offer four-year degrees.

Of the 143 proposals received in 2018, a small number (13) were submitted collaboratively by multiple institutions, thus this set of proposals represented 161 institutional submissions. These institutions spanned 42 states and were primarily institutions of higher education that granted four-year degrees (see Exhibit 2).

Exhibit 2. Types of institutions submitting proposals (2018)



Source: Proposal documents for 161 institutional submissions received in response to the 2018 IRES solicitation and Integrated Postsecondary Education Data System (IPEDS) data for the institutions that submitted these proposals.

Note: The number of institutional submissions is greater than the number of proposals because 13 of the proposals were collaborative proposals submitted by two or more institutions.

Panels of experts provided meaningful assessments of submitted proposals to inform the award selection process.

Reviewers assess the strengths and weaknesses of proposals along the NSF-wide merit review criteria—intellectual merit and broader impacts[19] —and program-specific review criteria added in 2012 with one exception noted below:

- Appropriateness of the student recruitment and selection plans
- Quality of plans for student preparation
- Appropriateness of the host research mentors and host institution or location
- Suitability of the research mentoring plan and project for the academic level of the intended student participants, the length of the program, and the facilities available

- Plans to enhance the project's effectiveness and impact on students' careers or their disciplines after completing the overseas experience, to disseminate research results and experiences within the discipline and among other students
- Quality of the evaluation plan (added in 2018)

Panels identified more strengths among awarded proposals than declined proposals across all review criteria.

Consistently across all NSF-wide and IRES-specific review criteria, panels identified strengths for a larger share of awarded projects and weaknesses for a larger share of declined proposals (Exhibit 3). The strengths among awarded proposals included their intellectual merit and broader impacts, the two NSF-wide review criteria. These proposals also demonstrated strengths in their plans for recruiting and selecting students, preparing students for the experience, and mentoring them—activities that align with the program's theory of change—as well as the suitability of their plans for the academic level of students they were serving. Also, eight of the awarded proposals were described in NSF documents as involving students in particularly cutting-edge research.

However, even awarded proposals had areas in need of improvement. For one-quarter of awarded proposals panels did not identify notable strengths in two areas—plans to provide students with follow-on opportunities after returning from the international research experience and plans to evaluate the project. Also, panels identified weaknesses in almost half of awarded proposals in their plans for student preparation in both academic and research topics (46 percent).

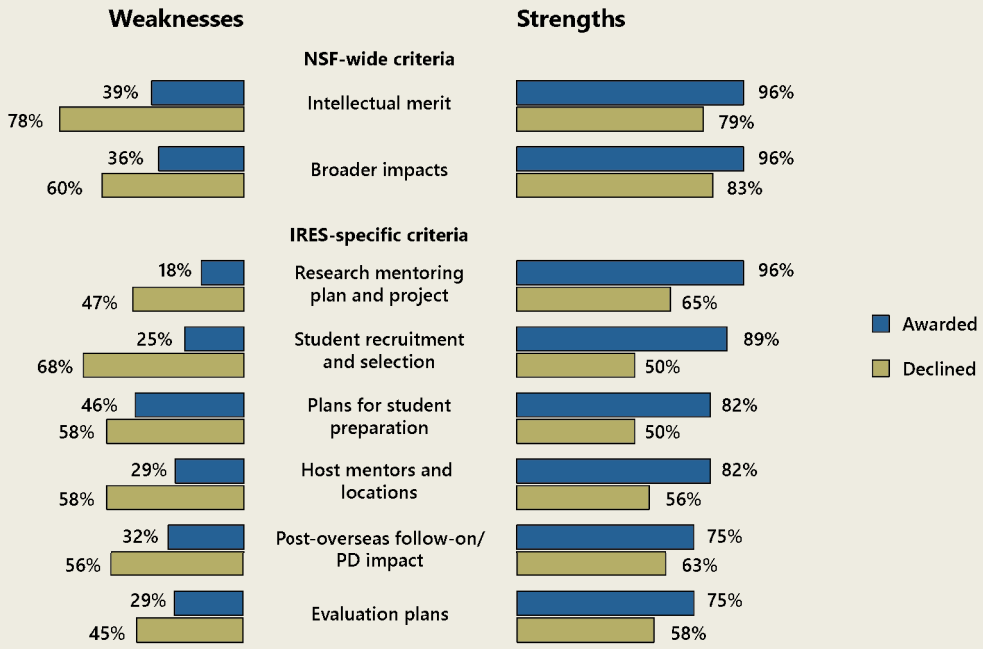
The IRES program received a strong pool of proposals, including some unfunded proposals that may have been worthy of funding if available resources had allowed.

The IRES program is competitive, as reflected in the positive elements that panels document among both awarded and declined proposals. Further, the large number of declined proposals for which panels identified strengths across many review criteria suggests that some meritorious proposals may go unfunded because of resource constraints. Indeed, 17 percent of declined proposals had strengths identified in the two NSF-wide and three IRES-specific criteria that were key strengths among awarded proposals.

The 2018 awarded projects proposed research experiences for an average of 19 students, lasting an average of 7 weeks.

The number of students that awarded proposals planned to provide international research experiences for (19 students over the course or their project) was just slightly more than the average number of students indicated in declined proposals (17 students). Similarly, awarded proposals planned to offer international experiences lasting an average of seven weeks, compared to an average of eight weeks among declined proposals.

Exhibit 3. Criteria in which review panels identified strengths and weaknesses of 2018 proposals



Source: Panel review summaries for 143 proposals (28 awarded and 115 declined) responding to the 2018 IRES solicitation.

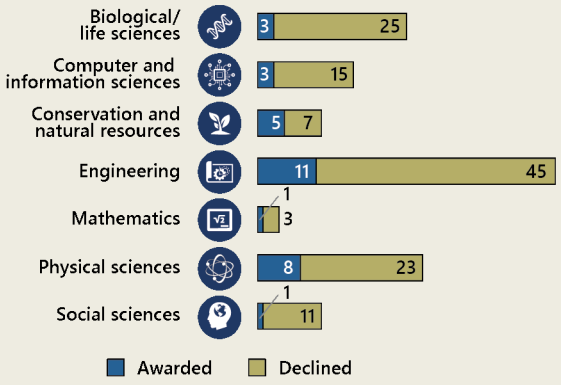
Note: Bars show the share of proposals that had strengths or weaknesses discussed in the panel summaries.

PD = professional development.

Awarded proposals largely reflect the variation in disciplines of the proposals submitted.

Among 2018 proposals, overall and awarded proposals, engineering and physical sciences were the disciplines with the most representation, while mathematics and social sciences had the least representation (Exhibit 4). The overall rate of acceptance among these 2018 proposals was 20 percent, ranging from a high of 42 percent among those that involved conservation and natural resources to 11 percent among those that involved social sciences.

Exhibit 4. Disciplines of awarded and declined 2018 proposals



Source: 143 proposals (28 awarded and 115 declined) submitted in response to the 2018 IRES solicitation.

Note: Totals sum to more than the number of proposals because proposals could involve multiple disciplines.

The merit review process has produced the IRES portfolio described in the next section.

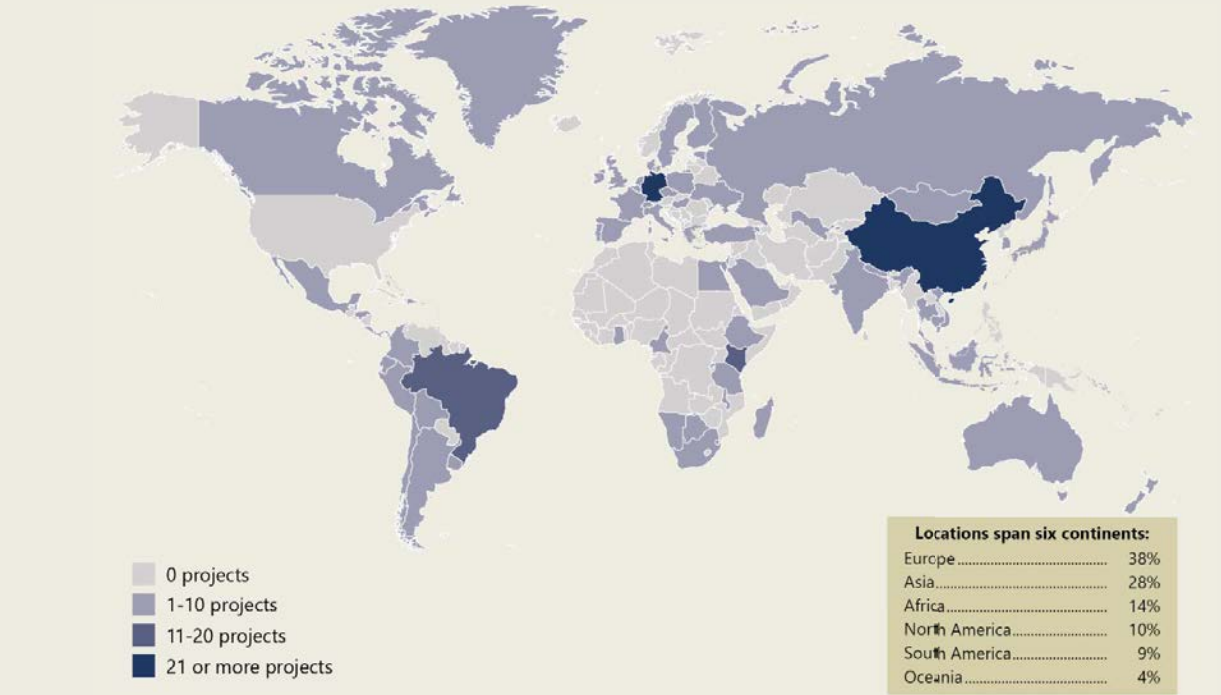
4. IRES PORTFOLIO (2006–2018)

Records of all IRES projects that have received funding are maintained in NSF's FastLane computer system. We analyzed the characteristics of the 273 projects awarded since 2006, as well as the characteristics of institutions that have received awards to host these projects.[20] A small number of IRES projects (20) have been collaborative (that is, involving awards to multiple institutions), resulting in 294 awards. Some analyses below are based on the 294 awards and some on the 273 projects.

Since 2006, IRES has funded 273 projects that have provided cohorts of students with international experiences around the globe.

Students have engaged in research in 77 different countries, spanning every continent but Antarctica. The majority of sites have been located in Europe (38 percent) and Asia (28 percent), with fewer sites located in Africa (14 percent), North America (10 percent), South America (9 percent), and Oceania (4 percent) (Exhibit 5). In each continent, the following countries have hosted the largest number of sites: Germany (27), China (29), Kenya (11), Mexico (10), Brazil (11), and Australia (9).

Exhibit 5. Locations of international research experiences (2006–2018)



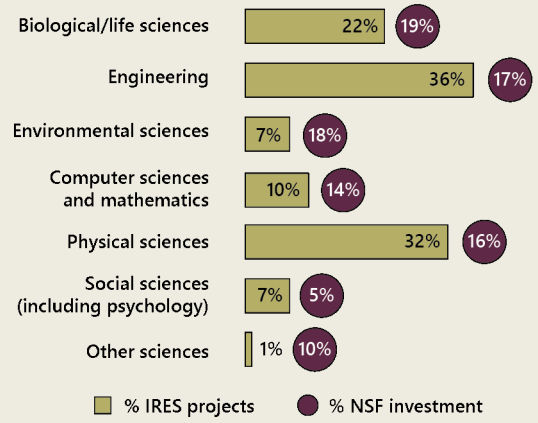
Source: FastLane data for 273 IRES projects.

Note: Percentages sum to more than 100 because projects could involve multiple international locations.

IRES projects represent the full range of disciplines in NSF's larger research portfolio.

Projects involve a range of disciplines, most commonly engineering and the physical sciences (Exhibit 6). These two disciplines represent a far larger share of the IRES portfolio compared with NSF's overall research investments.[21]

Exhibit 6. Disciplines of IRES projects (2006–2018) and NSF's overall research portfolio



Source: FastLane data for 273 IRES projects (2006–2018) and data on NSF obligations for research in fiscal years 2006–2018, by discipline, from the NSF Survey of Federal Funds for Research and Development, fiscal years 2006–2018.

Notes: Estimates compare the percentage of IRES projects involving a discipline to the percentage of NSF's dollar obligations in that discipline. 'Other sciences' includes sciences not classified in the other disciplines.

IRES percentages may sum to more than 100 because projects could involve more than one discipline.

Awards have been granted primarily to institutions of higher education offering at least a four-year degree.

The vast majority of awards (287 of 294) were granted to institutions that offer at least a four-year degree. Only 7 awards were granted to other types of institutions (Exhibit 7). One is a two-year college and the others are museums and professional societies. Among awardee institutions, 74 percent offer Ph.D. programs. The share of IRES institutions that are minority serving institutions (MSIs)[22] (18 percent) is slightly larger than their representation among institutions of higher education nationally (14 percent of institutions eligible for federal financial aid under Title IV of the Higher Education Act are MSIs).[23]

Exhibit 7. Types of institutions receiving awards (2006–2018)

287 Four-year college or university
218 *Doctorate (high research)*
11 *Doctorate (moderate research)*
43 *Master's*
15 *Baccalaureate*
1 Two-year college
6 Non-IHE

Source: FastLane data for 294 IRES awards and Integrated Postsecondary Education Data System (IPEDS) data for the institutions that received these awards.

Notes: The number of awards (294) is greater than the number of projects (273) because collaborative projects were funded through awards to more than one institution. For awards that transferred institutions, we include the institution that held the award the longest or expended the greater amount of funds.

Awards have been granted to institutions in 45 states and the District of Columbia.

The 294 awards are spread broadly across the United States (Exhibit 8, on the next page). California is the only state that has received more than 20 awards, which is not surprising given the large number of institutions of higher education in California.

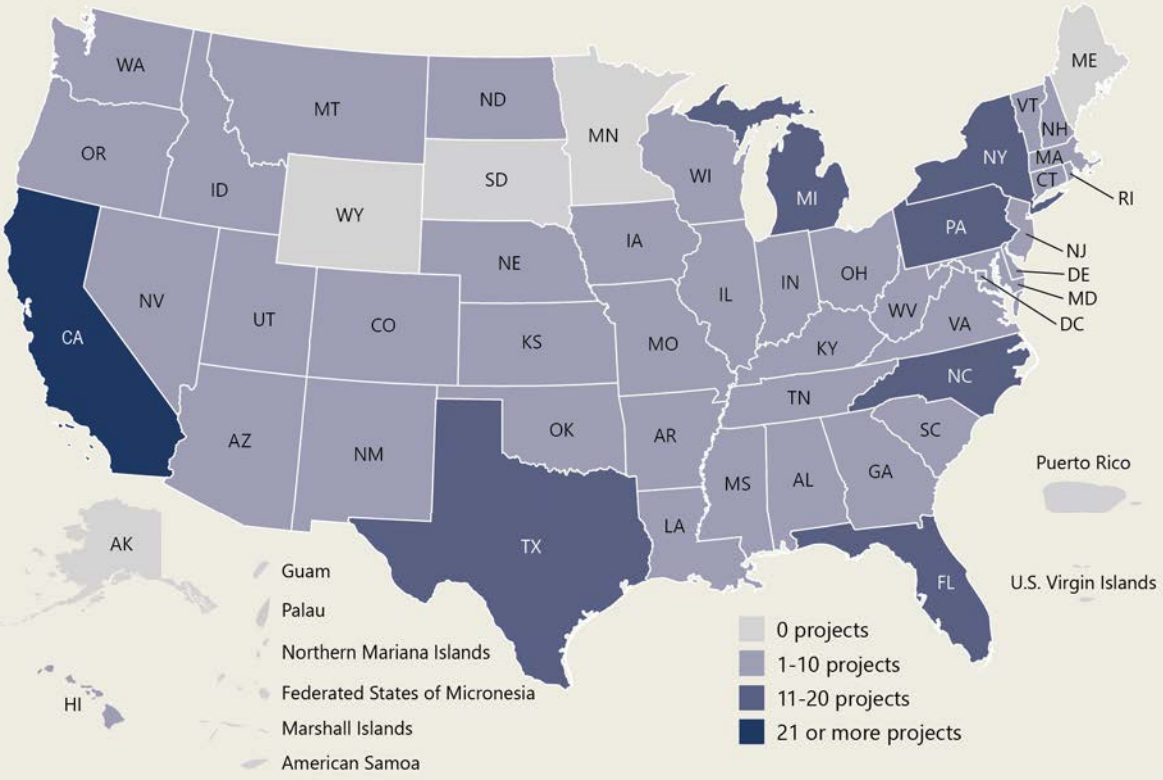
More than half of projects involve both undergraduate and graduate students, creating opportunities for near-peer mentoring.

The IRES program includes graduate student participants not only to promote research and student preparation, but also to expand mentoring opportunities for undergraduate students. These opportunities may exist in more than half of IRES projects, that is, those that include both undergraduate and graduate students (Exhibit 9, on the next page). Fewer projects support solely undergraduate students (38 percent) or graduate students (7 percent).

On average, projects funded from 2006 to 2018 created opportunities for 16 student participants across their years of funding.

The predominant model of implementation involves projects sending a handful of students abroad each year, initiating a new cohort of students each year. Students spend eight weeks, on average, conducting research in an international location. However, a small number of projects provide a more intense experience for a smaller number of students. For example, five projects proposed to work with six or fewer student participants in total, including one project that proposed to support three students with 24 weeks abroad in each of its three years of funding.

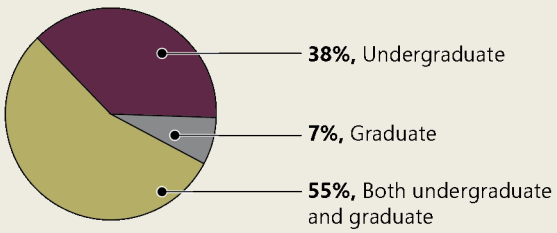
Exhibit 8. Number of grants awarded to institutions in each state (2006–2018)



Source: FastLane data for 294 IRES awards granted to institutions implementing 273 projects.

Note: The number of awards is greater than the number of projects because collaborative projects were funded through awards to more than one institution.

Exhibit 9. Student participants eligible for IRES projects (2006–2018)



Source: FastLane data for 242 projects; missing data for 31 projects.

Note: Percentages show the share of projects that involve undergraduate students, graduate students, or both.

5. IRES IMPLEMENTATION (2013)

The project reports that principal investigators submit annually to NSF serve as a primary source for understanding how the awards are being implemented. These reports include updates on participants and activities offered in the preceding year. We reviewed the reports that 15 projects submitted by the 2013 awardees to better understand the activities supported by and outcomes associated with IRES projects.[24]

In preparing their annual reports, principal investigators follow instructions provided in the technical reporting requirements for all NSF awards, which do not contain IRES-specific guidance. Thus, in their annual reports, principal investigators are not instructed to include the range of details they provided in their proposals, such as information on their recruitment plans, selection processes, or pre-departure preparation activities. This absence of information limits the usefulness of these reports for understanding implementation, which should be considered when interpreting some of the findings below.

Activities

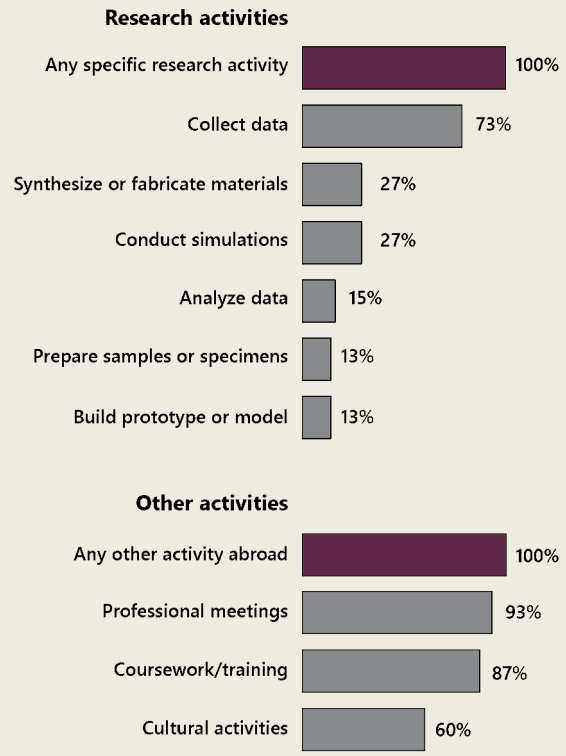
Annual reports contained limited information about recruiting and selecting student participants.

Of 15 projects, 10 discussed in their annual reports how they recruited students and 7 provided some details about how they selected students. Unlike NSF's Research Experiences for Undergraduates (REU) program, IRES does not set requirements for involving students outside the host institution, and 11 of the 15 projects involved participants solely or primarily from their host institution; only 6 projects reported extending their recruitment outside their institution.

Projects supported students' professional development while they are abroad through a variety of research and non-research activities that promote skills development and international engagement.

All projects discussed some aspect of the international research experience they provided to students. At the international sites, research activities overwhelming involved data collection (Exhibit 10). Students also participated in professional meetings, such as international academic conferences, and received additional training, such as in the areas of scientific writing, lab safety, and data collection and modeling.

Exhibit 10. International activities reported by 2013 projects



Source: Annual and final reports of 15 IRES projects awarded in 2013.

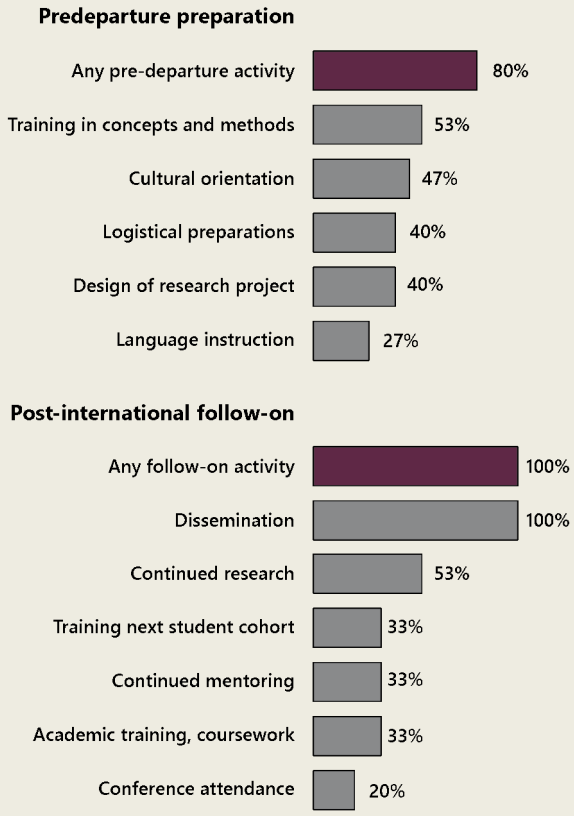
Projects also supported students' professional development with pre-departure preparation activities.

Eighty percent of the projects reported predeparture activities to prepare students for their international experiences (Exhibit 11), although only 60 percent included detailed information in their reports on the activities provided. The projects that reported such information helped students maximize the benefits of their international experiences by providing activities such as instruction on the research methods the students would use while abroad and an orientation to the countries they would be visiting. For example, some projects offered a semester-length preparatory course that covered research design and methodology, cultural context, and language instruction. Other projects offered workshops or trainings on specific topics, such as the responsible conduct of research.

Projects also supported students' professional development with post-international research follow-on activities.

All projects reported that students were engaged in efforts to disseminate their research findings through papers and presentations after participating in the international experiences (Exhibit 11). Some projects noted that the students and their host research mentors jointly drafted manuscripts that were submitted for publication. Most projects (93 percent) also discussed other follow-on activities in which students engaged, including continuing to conduct research related to the project on which they worked while abroad and receiving continued mentoring from an individual associated with the project. For example, the principal investigator of one project held weekly conversations with IRES alumni that covered topics such as developing a curriculum vitae and identifying potential graduate school mentors.

Exhibit 11. U.S.-based activities to support students reported by 2013 projects



Source: Annual and final reports of 15 IRES projects awarded in 2013.

Outputs and outcomes

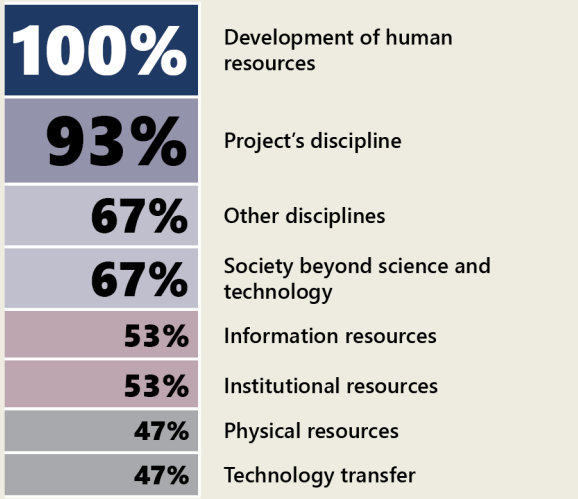
Projects commonly reported research outputs, such as publications, associated with the research conducted by students.

The most common outputs included producing publications (93 percent) or making presentations (87 percent). Projects also reported developing databases (20 percent); creating educational resources, curricula, and tutorials (13 percent); and patent applications (13 percent).

All projects reported developing human capital, and most specified outcomes in other domains.

Describing outcomes related to the development of human capital, for example, one principal investigator cited that the project enhanced students' ability to work in international, cross-cultural settings and to develop key questions, hypotheses, and methods to study socio-ecological drivers and consequences of global climate change. Most projects also reported that their work contributed to advancing knowledge in the project's discipline and in some cases with direct practical applications (Exhibit 12). For example, one project reported that its human factors research will impact the development of displays in automobiles.

Exhibit 12. Areas of impact reported by 2013 projects



Source: Annual and final reports of 15 IRES projects awarded in 2013.

Note: These areas are specified in the *NSF Project Reporting Format*.

In addition to reporting on the NSF-defined impact domains, 10 of the 15 projects (67 percent) mentioned that the IRES award contributed to enhanced collaboration between the principal investigator's institution and the host institutions. For example, one principal investigator's institution hosted researchers from the project's collaborating international institution for short-term residencies. The host researchers gave talks, led seminars, and worked with the principal investigator to develop a new research project.

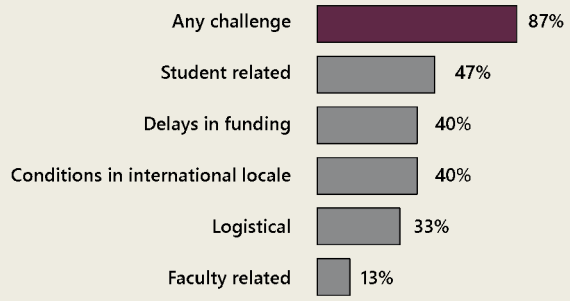
Challenges and changes in plans

Most of the projects reported implementation challenges, commonly related to experiences of a single student participant.

Challenges reported were most commonly related to the student participants (Exhibit 13). These challenges included students dropping out of the program or failing to meet performance standards. Other challenges included increased project costs due to changes in exchange rates or customs charges, problems obtaining extended visas, and the departure of project team members.

The projects often described how they had or planned to address the reported challenge.

Exhibit 13. Challenges reported by 2013 projects

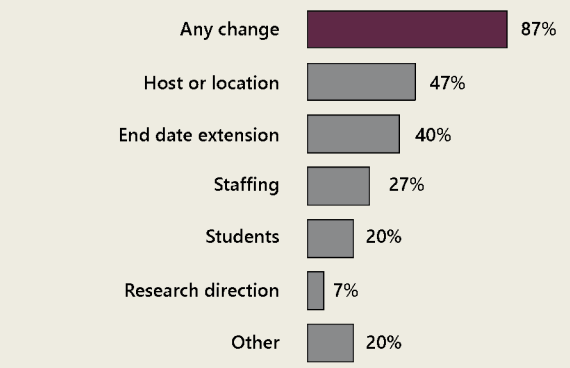


Source: Annual and final reports of 15 IRES projects awarded in 2013.

A large proportion of projects reported deviations in planned implementation, often in response to challenges encountered.

Almost half of the projects reported changes in either the host partners or country from what they had originally proposed (Exhibit 14). Some of the reasons cited for changing host partners or countries included unrest in the original country, host partners changing universities, and host partners no longer being able to accommodate IRES students.

Exhibit 14. Changes reported by 2013 projects



Source: Annual and final reports of 15 IRES projects awarded in 2013.

Note: 'Other' includes changes in the: principal investigator's institution, policies at the international site that affected student requirements, and post-international follow-on activities that projects offered.

Another common change was the extension of projects beyond the initial three-year time frame. Projects often requested extensions because delays in grant awards caused delays in project activities. For example, in some cases, these delays caused the first cohort of students' international experiences to be postponed. Some projects also provided an international research experience to an additional cohort of students if previous cohorts were smaller than planned. Such cases were generally due to students dropping out, which was most often due to unexpected personal circumstances such as family illness.

6. CONSIDERATIONS FOR THE FUTURE

The following considerations are offered as the program positions itself for future monitoring and evaluations, as well as furthering the preparation of internationally engaged scientists.

Expand monitoring of participant experiences and outcomes. Additional information is needed to fill gaps in what is known about participant experiences in IRES and any related outcomes, including their educational and career trajectories. The current plan to set up an electronic data system is an important step in gathering participant-level information. Importantly, the ongoing survey of former participants will provide a snapshot of student educational and employment outcomes and should serve as a pilot to consider integrating a similar survey as part of the IRES data system. Further, a measure of participant experiences through a participant exit survey is being pilot tested for potential inclusion in a monitoring system.

Current activities and plans for data collection could boost contributions to knowledge about the experience in and outcomes of students' international research experiences. The data system being developed for the IRES program will enable users to investigate key outcomes across all projects and to conduct additional research that could contribute to the literature on international research experiences for students. For example, all IRES awardees noted that their projects had an impact on human capital development. The data system—that will be designed using information that principal investigators provide in proposals and annual reports—could explore project components associated with observed impacts.

Enhance proposal and report preparation through program-specific guidance. Annual reports are a primary source of data about project implementation. However, unlike proposals, these reports often do not include information about key components of IRES. For example, one of the IRES-specific review criteria on which proposals were assessed was the appropriateness of student recruitment and selection plans. Projects later provided limited, and sometimes no, information in the annual reports on the success of their proposed plans. This limits NSF's ability to monitor implementation and progress toward program goals. Providing IRES-specific guidance for the annual reports could strengthen these as a source of information to monitor project implementation and outcomes.

Further, the findings presented in this report highlight some areas where NSF might want to provide additional guidance to those submitting proposals on what is expected in terms of plans for IRES-specific components. These areas include (1) preparing students for their international experiences, (2) providing follow-on professional development of students, (3) the selection of mentors and host institutions, and (4) evaluating the project.

Consider the disciplinary and institutional balance in the portfolio. As a primary mechanism for funding student international research experiences, IRES can play an important role in preparing future globally engaged scientists across disciplines. At present, the balance of science and engineering disciplines reflected across projects differs somewhat from NSF's overall research investment portfolio. It might be worthwhile to consider whether this is the desired balance and, if not, whether to encourage proposals from disciplines that either are less represented (if alignment with broader NSF investments is a goal) or that align with broader NSF priorities (such as NSF's 10 Big Ideas).

Moreover, the program might want to consider the extent to which its current portfolio offers opportunities to students from a wide-range of institutions. The institutions that receive IRES awards have largely been doctoral universities. If NSF is interested in ensuring that students beyond these institutions have access to IRES international research experiences, the program might consider: supporting other institutions in their efforts to submit competitive proposals, or placing greater emphasis on encouraging projects to recruit students from outside their institutions.

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ENDNOTES

[1] Although IRES was coupled with the Doctoral Dissertation Enhancement Projects (DDEP) in its initial solicitation, the DDEP awards are excluded from the evaluation. Similarly, although the program was expanded to three tracks in the 2018 solicitation, we excluded Track II—Advanced Studies Institutes, which supports U.S. graduate students in intensive short courses at international locations—and Track III—New Concepts in International Graduate Education, which supports large-scale efforts of U.S. graduate students participating in international research and professional development experiences.

[2] Matherly et al. 2014, 2015; Ragusa et al. 2014

[3] Martinez et al. 2012a, 2012b, 2015a, 2015b

[4] Martinez et al. 2012a, 2012b, 2015b

[5] Martinez et al. 2015a

[6] Martinez et al. 2012b, 2015b

[7] Martinez et al. 2012a

[8] Martinez et al. 2015a

[9] Martinez et al. 2012a

[10] Martinez et al. 2012b, 2015b

[11] Martinez et al. 2012a, 2012b, 2015b

[12] Arzberger et al. 2010; Casad et al. 2018; Flattau et al. 2009; Institute of International Education 2009; Matherly et al. 2014, 2015; Martinez et al. 2015a; Ragusa et al. 2014; Spencer 2008

[13] Arzberger et al. 2010; Casad et al. 2018; Institute of International Education 2009; Matherly et al. 2014, 2015; Martinez et al. 2015a; Phillips et al. 2014; Ragusa et al. 2014; Spencer 2008

[14] Flattau et al. 2009; Institute of International Education 2009; Martinez et al. 2012a, 2012b, 2015a; Martinez et al. 2015b; Spencer 2008

[15] Flattau et al. 2009; Institute of International Education 2009; Phillips et al. 2014; Spencer 2008

[16] Arzberger et al. 2010; Casad et al. 2018; Institute of International Education 2009; Martinez et al. 2015a

[17] Institute of International Education 2009; Martinez et al. 2012a, 2012b, 2015b

[18] Mabrouk 2016

[19] The intellectual merit criterion encompasses the potential to advance knowledge; the broader impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

[20] The evaluation is limited to IRES Track I, so DDEP and Tracks II and III are not included in these counts.

[21] Proportion of NSF distribution to disciplines was calculated from obligations for research for fiscal year 2017 https://ncsesdata.nsf.gov/fedfunds/2017/

[22] MSIs are those designated as a Historically Black College or University (HBCU), Hispanic-serving institution (HSI), Tribal college or university, Alaska Native-serving institution, Native Hawaiian-serving institution, predominately black institution, Asian American and Native American Pacific Islander-serving institution, or Native American-serving nontribal institution. Two percent of IRES awards were granted to HBCUs and 13 percent to HSIs.

[23] Espinosa et al. 2017.

[24] The 2013 cohort of projects was reviewed because they were the most recent cohort to have completed all project activities and submitted all annual and final reports.