

Career Patterns of Foreign-Born Scientist and Engineers, Trained and/or Working in the U.S.

How SRS's Proposed Postdoc Survey Can Provide Information on Birth and Training Origins of Postdocs

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Introduction

The Division of Science Resources Statistics (SRS) fulfills the legislative mandate of the National Science Foundation Act to:

provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources, and to provide a source of information for policy formulation by other agencies of the federal government.

To carry out this mandate, SRS designs, supports, and directs about 11 periodic surveys as well as a variety of other data collections and research projects. Four SRS surveys currently collect valuable but limited information about postdoctoral researchers (postdocs): the Survey of Earned Doctorates (SED), the Survey of Doctorate Recipients (SDR), the Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS), and the National Survey of College Graduates (NSCG). Three of these are discussed below and throughout this paper: the SED, the SDR, and the GSS.

- SED – Is an annual survey that is designed to collect information from all individuals receiving research doctoral degrees from U.S. institutions at the time of their degrees. Data are provided at the time of graduation on postgraduation plans and may include the location of a postdoc appointment. However, there is not any information on whether plans change, on postdocs at a later time, on the Ph.D. equivalent professional degree¹ or on foreign-Ph.D. degreed postdocs. Although the SED provides data on foreign-born postdocs who received U.S. doctorates, data are not collected on foreign-born postdocs who received their doctorates from a foreign institution.
- SDR – Is a biennial longitudinal sample survey of science, engineering and health (SEH) research doctorates from cohorts of the SED that collects data on their supply, utilization, and demographic characteristics, including a broad range of data on their employment. While the sample size for the SDR is large (40,000), the share of the SEH population in a postdoc at any point in time is small enough that there are limitations on the depth of analysis that can be pursued. The survey asks whether the job held during the reference week was a postdoc appointment; for those who reply yes, it asks the reason for taking the postdoc appointment. In addition, the SDR has been used to study postdocs in the following two ways.
 - Longitudinal Analysis – Since the SDR captures longitudinal information on employment, sequential SDR surveys can identify changes in employment from a postdoc appointment to other types of employment, including tenured academic employment. Over time, the SDR can be used to compare career progression for

¹ The Ph.D. equivalent professional degrees of interest are those in medical and related fields, including: M.D., D.O., D.D.S., and D.V.M. In the remainder of this report, we will refer to this group as professional Ph.D.s.

respondents who were postdocs to nonpostdoc respondents in their degree completion cohort.

- SDR Postdoc Module – The 1995 and 2006 SDR postdoc modules provide enhanced postdoc data, particularly in terms of the count of postdocs by sector and discipline, on the number, type, duration, and value of postdoc appointments. The module can be used to look at trends in postdoc experiences by degree completion by cohort. In addition, the modules included information on: the number of postdocs ever held; information on the three most recent postdocs; and relevance of the postdoc(s) to career development.

The SDR provides data on individuals with U.S. Ph.D.s who are resident in the U.S. However, the SDR is limited by the exclusion of professional Ph.D.s, foreign-degreed temporary residents, non SEH S&E Ph.D.s, and U.S. Ph.D.s residing outside of the U.S. Once a decade, the NSCG picks a sample from the long form of the decennial census and can provide data on all postdocs at that time including the foreign degreed.

- GSS – The Survey of Graduate Students and Postdoctorates in Science and Engineering is an establishment survey of all U.S. academic institutions offering graduate programs in SEH fields. The GSS collects demographic and financial support data at the department level for graduate students, postdocs, and non-faculty researchers. It assesses trends in financial support patterns and shifts in graduate enrollment and postdoc appointments. The GSS is the only annual source of aggregate data on foreign/temporary resident postdocs. The GSS does not request data on the source of their doctoral degree (whether from a U.S. institution or foreign institution). Also, it does not collect data for individual postdocs and does not include postdocs in nonacademic establishments -- research institutions, nonprofits, industry and government.

Decision-makers and researchers have an interest in developing a deeper understanding of the impact of the large number of postdoc positions held by temporary residents. Postdocs who are U.S. citizens, permanent residents, and residents with temporary visas are all impacted by the large number of temporary resident postdocs. GSS statistics show that “foreign” (i.e. those on temporary visas) postdocs represent over 50 percent of all postdocs in SEH fields in U.S. academic institutions.

To determine the extent of the need and the feasibility of gathering in-depth information on postdocs in the U.S., SRS has been engaged in a multi-year project, the Postdoc Data Project (PDP). Current government-collected information provides incomplete counts of and limited characteristics on postdocs. However, it does not provide information for foreign-degreed doctoral holders in U.S. postdoc positions nor on how postdoc experiences relate to future outcomes.

Phase 1

In Phase 1 of the project, completed in 2006, SRS gathered information from the perspectives of policymakers, researchers, funders, postdocs, and postdoc data users on available data, data needed on postdocs, and methods for gathering needed postdoc data. Users identified the need for postdoc data across employment sectors (not just academe) on foreign-Ph.D. degreed/temporary resident postdocs and professional Ph.D. postdocs. Table 1 shows for three SRS surveys the current gaps in postdoc population coverage: (a) foreign-degreed

Ph.D./temporary residents in U.S. postdocs; (b) professional Ph.D. postdocs; and (c) postdocs in nonacademic establishments. A formidable project challenge is developing a framework and testing methodologies that obtain postdoc data from the nonacademic sector and for and from the foreign-Ph.D. degreed/temporary resident postdocs. No list exists from which to sample foreign-doctoral degree holders in the U.S. whereas a list does exist of U.S. awarded doctoral degree holders (i.e. SED).

Table 1. Postdoc Population Coverage of the GSS, SED, and SDR

Survey	Type of Data	Type of Ph.D.		Country of Ph.D.		Residency/Citizenship		Sector	
		Research	Equivalent	U.S.	Foreign	Citizen/Permanent	Temporary	Academic	Non-Academic
GSS	Aggregate Only	1	1	1	1 ^a	1	1	1	0
SED	Individual: Plans	1	0	1	0	1	1	1	1
SDR	Individual: Obtained Position	1	0	1	0	1	1	1	1

“1” - Data provided

“0” - Data not provided

^aForeign degreed postdocs are covered in the GSS; however, they are not separated from U.S. degreed postdocs.

Users also identified the need to expand the survey content on postdocs to include detailed data related to the quality of the postdoc experience and relationship to an S&E career. Currently collected data include counts, fields of degrees and employment specialty, demographic data, and funding sources. While this information is useful for discussing basic issues, it does not support more detailed analyses on important dynamics in the supply, conditions, productivity, and ultimate impact of the postdoc population on the scientific and technological enterprise. As a statistical agency, SRS surveys provide at least some information on the research topics/policy issues listed below, although some of these topics may be more aligned with the mission of agencies with postdoc-related programs such as those that fund postdocs and basic research.

- **Postdoc Population Statistics:** Need for information on the postdoc population across all sectors and disciplines, including the number of appointments, funding sources, the types of organizations that employ postdocs, duration of postdoc appointments, residency status, compensation, and benefits. The GSS examines trend data to measure changes in the population and characteristics of postdocs at academic institutions. The GSS, SED, SDR, and, once a decade, NSCG each furnish data that can be used to characterize the postdoc population.
- **Postdoc Quality and Experience Indicators:** Need for information directly from postdocs regarding decisions to seek, accept, complete or leave an appointment, the amount of training and guidance received, the determinants of a successful appointment, as well as the number of opportunities to conduct independent research and author publications. Among the SRS surveys, the 1995 and 2006 SDR postdoc modules provide the best information on the quality of the postdoc experience.
- **Institutional Data:** Need for information from organizations that employ postdocs regarding structures and procedures in place for supporting postdocs during their time with the organization and in career transition.

- **Career Transitions:** Need for longitudinal information for both U.S. and foreign-degreed postdocs regarding career aspirations and the progression from doctoral programs, through postdoc positions, to employment outcomes. The SDR provides information that has been and can be used to examine career transitions for U.S. SEH Ph.D.s. The longitudinal nature of the SDR, particularly the 1995 and 2006 SDR postdoc modules, makes it possible to examine the relationship of career experiences and career outcomes over time.

Phase 2

Given the results of Phase 1, the Phase 2 goals are twofold: to improve the SRS count of postdocs and to develop an SRS comprehensive sample frame of individual postdocs for future survey activities. In Phase 2 of the project, scheduled to end in 2008, SRS is exploring alternative approaches to identifying, locating and gathering data on and about postdocs from the nonacademic sector and for and from foreign-Ph.D. degreed postdocs. SRS is pursuing answers to the following questions:

- How to define, for locating and surveying postdocs, what is a postdoc position?
- Can, and will, nonacademic institutions provide the postdoc data that we need?
- Are Department of Homeland Security (DHS) immigration databases feasible sources for identifying and locating foreign-Ph.D./temporary resident postdocs?
- For efficiency and for widening the project's outreach, should we include recent Ph.D. recipients who are not postdocs in our study?
- Is it feasible, and if so how, to integrate the results from this project with existing SRS postdoc-related surveys on the S&E workforce, enhancing the value of those surveys without disrupting long-term trends.

Phase 2 Activities

Initial phase 2 activities involved two parallel efforts: (1) the conduct of background research on postdoc policies, definitions, and databases; and (2) the assessment of lists that may contribute to building a postdocs frame.

Background Research

Background research activities have included literature reviews on postdoc policies and definitions, compilation of questionnaires from postdoc studies, focus groups with academic and non-academic postdoc employers and postdocs themselves, and telephone-based site explorations with academic and non-academic postdoc employers. Several findings have emerged from these activities.

- First, the most definitive finding that crosses nearly all efforts is that postdoc definitions are inconsistent across organizations – both academic and non-academic sectors and inconsistently applied within institutions themselves.
- Second, locating and obtaining cooperation from an informant within an institution or organization knowledgeable about postdoc data issues can be a complicated and resource-intensive effort.
- Third, the most knowledgeable person is frequently not the same person who has direct access to the relevant data. We typically found that there was a policy person, a data access person, and perhaps gatekeepers for them both.

- Fourth, data about foreign-degreed postdocs were sometimes hard to obtain and there were differences in the availability of such information between academic vs. non-academic institutions.

Based on these findings and particularly based on the vast inconsistencies in postdoc definitions, SRS has considered the advisability of widening the study population to include individuals within the first 10 years after receiving their doctoral degree. This will allow SRS to examine individuals who fit various postdoc definitions, how they map into whether they self-identify as a postdoc, and to compare postdocs and nonpostdocs in early careers after the Ph.D.

List Assessments

To improve the SRS count of postdocs and to develop a comprehensive list frame that covers all the postdocs working in the United States, the SRS will evaluate the feasibility, quality, availability, and coverage of different postdoc-related lists, identify overlaps in the lists and remaining gaps in coverage, and ultimately compile different lists into one comprehensive list frame. The comprehensive list would be used in the future to collect postdoc information.

Improving the Postdoc Count

To improve the postdoc count, the SRS will sum the count of postdocs across all sectors using establishment lists from various sources that are not covered by the GSS, including government agencies, Federally Funded Research and Development Centers (FFRDCs), nonprofit organizations, and the private sector. To sum across all sectors, SRS will conduct a list assessment survey for each establishment-based source to determine the feasibility of collecting the count of postdocs at the establishment overall and by key characteristics, such as gender and other demographics, citizenship, funding sources, and foreign-degree status; whether the establishment can or will provide a list of their postdocs; and the relative ease, difficulty or willingness to provide such a list.

Developing a Comprehensive List of Postdocs

To develop a comprehensive list of postdocs that supplements the SED and the SDR, SRS will obtain various lists of individual postdocs and conduct list assessment surveys to determine the feasibility of collecting information from the individual on job characteristics, postdoc definitional elements (self-identifying as a postdoc), knowledge and impact of their establishment's postdoc policies, demographics, citizenship, foreign-degree status, funding sources, demographics, and organizations that the individual and other postdocs whom they know may belong to (and thus may be on other lists). The Student and Exchange Visitor Information System (SEVIS) (with identifiers) and H-1B databases combined should provide strong coverage related to the foreign born and foreign-degreed population. SRS may be able to obtain significant coverage of U.S. professional Ph.D.s through lists such as the Association of American Medical Colleges (AAMC) and the Association of American Veterinary Medical Colleges (AAVMC).

The two most promising sources for developing a comprehensive postdoc sample frame that fills the gaps in coverage related to foreign/temporary resident postdocs are from the Department of DHS: the SEVIS and the H-1B visa databases. With the cooperation of offices within the DHS, SRS could use these databases to identify new visa holders who could potentially be postdocs or new Ph.D.s. SRS could also use these databases to contact the individual organizations that host

temporary residents or new Ph.D.s to obtain lists of these individuals from the hosting organizations.

Although no individual source identifies the entire population of postdocs who are foreign-degreed doctoral holders, SRS believes that DHS has the most comprehensive list of foreign-degreed doctoral holders who are temporary residents. However, until SRS obtains access to and determines the utility of the DHS lists, the PDP will pursue sources of foreign postdocs from establishments that host them.² If none of the sources provides comprehensive coverage of nearly all of the foreign-degreed postdocs, then SRS will explore methods to use some or all of the available sources to develop the most comprehensive list possible for foreign-degree temporary resident postdocs or new Ph.D.s.

“Final” Postdoc Sample Frame

The background research and list assessment activities that are a part of Phase 2 all lead to the actual construction of a sample of individuals who have received a doctorate degree in SEH fields in the prior 10 years.

Postdoc Data Collection – Pretest 1

The purpose of the pretest would be to determine the utility of the postdoc sampling frame, to validate the quality of the frame, and to obtain information to de-dup the frame. Also, to determine the utility of integration with the SDR we will: verify frame information for all potential postdocs; determine the eligibility of the potential postdoc to remain on the frame for future potential postdoc-related surveys; determine the potential postdoc’s likelihood of/eligibility for being on other lists (foreign-degreed, associations, etc.); use experimental design to test the feasibility of strategies for conducting the pretest survey (including the use of incentives); and, to determine future postdoc survey needs in obtaining data related to postdoc experiences, perceptions and motivations.

Potential of the PDP

The PDP is designed to make use of the comprehensive coverage of the GSS and the longitudinal framework of the SED and SDR to furnish the kind of longitudinal information on early career Ph.D.s that has been identified by decision-makers and researchers. The results of Phase 2 of the PDP will determine SRS’s future and continued ability to develop a comprehensive postdoc information strategy.

² Another potential source in the future may be the American Community Survey (ACS) once SRS begins to use the ACS as a sample frame for the NSCG.