

## POSTDOC PARTICIPATION OF SCIENCE, ENGINEERING, AND HEALTH DOCTORATE RECIPIENTS

by Thomas B. Hoffer, Karen Grigorian,  
and Eric Hedberg, NORC<sup>1</sup>

According to data from the 2006 National Science Foundation (NSF) Survey of Doctorate Recipients (SDR), 45% of the most recent science, engineering, and health (SEH) doctorate recipients<sup>2</sup> had completed or were participating in postdoctoral appointments, up from 41% in 1995.<sup>3</sup> The median length of postdoctoral appointment over that time period remained at approximately 2 years, continuing a 30-year trend.

Long a standard transition stage for doctorate recipients in the life sciences, the postdoctoral appointment (*postdoc*) has become increasingly common in all SEH fields. The SDR defines a postdoc as a temporary position awarded in academe, industry, a nonprofit organization, or government primarily for gaining additional education and training in research. This InfoBrief examines postdoc participation patterns by doctoral fields of study, focusing on patterns of stability and change between doctoral cohorts.

### Trends in the Use and Duration of Postdocs

New doctorate recipients are increasingly likely to take postdocs, and that is evident in the 2006 SDR data: among all SEH doctorate recipients, 38% had held a postdoc at some point in their careers (table 1). More recent cohorts were more likely than earlier ones to have held a postdoc: 45% of those earning the doctorate within the last 5 years compared with 31% of those who earned the doctorate more than 25 years ago.

The likelihood of taking a postdoc varies by field of doctorate. Individuals who earned doctorates in the life sciences (57%) or physical sciences (50%) were most likely to report having had a postdoc.<sup>4</sup> Doctorate recipients in engineering (21%), computer/mathematical sciences (21%), and the social sciences (including psychology) (23%) were much less likely to have held a postdoc.

The increases in postdoc participation rates from earlier to more recent doctoral cohorts were greatest for doctorate recipients in engineering (164%) and computer/mathematical sciences (82%). Increases in these fields were particularly pronounced between the most recent cohort (5.0 years or less) and all earlier cohorts.<sup>5</sup> Life sciences doctorate recipients had the largest absolute increase between the earliest cohort (49%) and those who earned the doctorate 20.1 to 25.0 years prior (57%) but little growth in postdoc participation among more recent cohorts. A similar pattern was evident for physical sciences doctorate recipients, except that the largest jump occurred between the 20.1–25.0 and 15.1–20.0 years-since-doctorate cohorts.

Among those who have held postdocs, the time spent in the appointment can vary substantially. Longer overall time in postdoctoral status can reflect lengthier single appointments or multiple, usually successive, postdocs.<sup>6</sup> Figure 1 shows that the median duration of the most recently completed postdoc generally increased



TABLE 1. Percentage of SEH doctorate recipients who have held one or more postdocs, by years since doctorate and broad field of doctoral study: 2006

Years since doctorate <sup>a</sup>	All SEH doctorate recipients	Broad field of doctorate (%)					
		All fields	Computer/mathematical sciences	Engineering	Life sciences <sup>b</sup>	Physical sciences	Social sciences, including psychology
All years	711,800	38	21	21	57	50	23
5.0 or less	102,900	45	31	37	59	59	30
5.1–10.0	115,200	39	22	20	59	52	27
10.1–15.0	103,300	43	21	29	63	58	27
15.1–20.0	82,800	38	20	17	60	57	21
20.1–25.0	77,800	35	16	13	57	47	21
25.1 or more	229,400	31	17	14	49	43	18

SEH = science, engineering, and health.

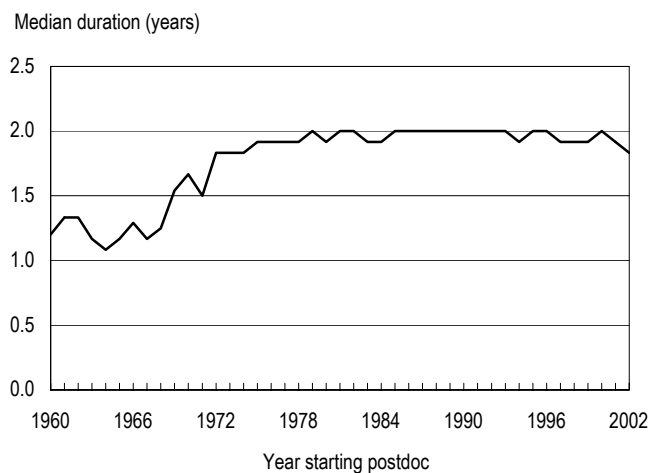
<sup>a</sup>Calculated by converting number of months between receipt of doctorate and survey reference date (1 April 2006) to decimal years.

<sup>b</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

FIGURE 1. Median duration of the most recent postdoc, by year starting the most recent postdoc: 2006



NOTES: Data are shown only up to postdocs beginning in 2002 and ending mostly by 2004 because a large proportion of recent science, engineering, and health doctorate earners who entered a postdoc after 2004 were still working in those positions in 2006. Although some of these recent doctorate recipients have completed their postdocs, these individuals disproportionately have short postdocs.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

from the early 1960s until the early 1970s but remained fairly stable at about 2 years for the next 30 years. The length of postdocs varies by field of study. Postdoc holders who earned their doctorates in life sciences, physical sciences, and computer/mathematical sciences had longer postdocs than did those in engineering and social sciences (including psychology) (table 2).

### Employment Sector of Postdocs

Although postdocs are often equated with academic or university research settings, about one-fourth of postdoc holders are employed by the government, private nonprofit organizations, and industry. For the SEH population as a whole, 75% of those who held postdocs were employed by an educational institution, 11% worked in for-profit or nonprofit companies or organizations, and 12% worked in government (table 3). This distribution was generally similar for postdoc holders from each of the broad fields of doctoral study. The main exception was social sciences; doctorate recipients in these fields accept a higher proportion of postdocs in for-profit/nonprofit organizations than in government. Further analysis shows that this employ-

TABLE 2. Median duration of most recently completed postdoc for SEH doctorate recipients, by years since doctorate and broad field of doctoral study: 2006 (Years)

Years since doctorate <sup>a</sup>	All fields	Computer/ mathematical sciences	Engineering	Life sciences <sup>b</sup>	Physical sciences	Social sciences, including psychology
All SEH doctorate recipients						
with postdocs	1.9	1.8	1.3	2.2	1.9	1.1
5.0 or less	1.4	1.8	1.2	1.8	1.8	1.0
5.1–10.0	1.9	1.9	1.7	2.2	2.0	1.4
10.1–15.0	2.0	1.8	1.3	2.6	2.0	1.3
15.1–20.0	2.0	1.7	1.5	2.5	2.0	1.4
20.1–25.0	2.0	1.8	1.0	2.3	1.9	1.1
25.1 or more	1.8	1.0	1.0	2.0	1.7	1.0

SEH = science, engineering, and health.

<sup>a</sup>Calculated by converting number of months between receipt of doctorate and survey reference date (1 April 2006) to decimal years.

<sup>b</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTE: Estimates do not include those currently on a postdoc.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

ment-sector deviation is driven by employment patterns for recipients of psychology doctorates, 60% of whom took postdocs in academe and 24% of whom had postdocs at for-profit or other nonprofit organizations. In contrast, other social sciences doctorate recipients with postdocs were similar to postdoc holders in other fields, with 82% of the other social science doctorates working in postdocs in educational institutions and 8% in for-profit or other nonprofit organizations. Analysis of the sector locations by years since earning the doctorate show few differences among cohorts in terms of the balance between higher education, industry, nonprofit organizations, and government.

### Work Activities and Reasons for Taking Postdocs

Individuals who were working in a postdoc on the April 1 reference date of the 2006 SDR were asked to indicate their primary and secondary work activities. Table 4 shows that about 88% of the current postdocs in 2006 identified research and development as a primary or secondary work activity, and 9% identified teaching. Among postdocs in 1995, 95% identified R&D as a primary or secondary activity, suggesting changes in the past decade in the work activities that constitute postdoc assignments. It does not appear that teaching as a primary or secondary work activity, however, has increased, indicating that other types of work activities are the reason for the decline in time spent on R&D.

An important set of research questions concerns the reasons for taking postdocs, how those reasons may differ by discipline, and whether they are changing across doctoral cohorts.<sup>7</sup> Of particular concern has been whether the growth of postdocs reflects a relative lack of tenure-track openings, such that postdocs provide a sort of safety net for individuals committed to academic careers until the preferred positions become available.<sup>8</sup>

The SDR shows that the most frequently cited reason for the current or most recent postdoc was to gain additional training in the doctoral field, identified as the main reason by 34% of all postdoc participants (table 5). This was followed by “work with a specific person or place” (19%) and “postdoc generally expected for a career in this field” (19%). Examining the main reasons for taking postdocs, a few notable differences are evident. Engineering doctorate recipients were much more likely than others to identify “other employment options not available” (23%) and were less likely than others to identify “postdoc generally expected for a career in this field” (7%).

### Trends in Health and Retirement Benefits for Postdoc Participants

The availability of health and retirement benefits to postdoc participants has been an important issue to advocacy groups in recent years as the use of postdocs has grown and become a standard career step in more

TABLE 3. Sector of employment of current or most recent postdoc, by years since doctorate and broad field of doctoral study: 2006  
(Percent distribution)

Years since doctorate and employment sector <sup>a</sup>	All fields	Computer/mathematical sciences	Engineering	Life sciences <sup>b</sup>	Physical sciences	Social sciences, including psychology
<b>All SEH doctorate recipients</b>						
with postdocs (number)	267,300	10,100	26,100	116,600	68,000	46,500
All employment sectors	100	100	100	100	100	100
Education	75	83	76	77	75	65
For-profit or nonprofit	11	8	8	11	9	20
Government	12	7	15	12	15	10
Other	2	2	1	*	*	5
5.0 or less (number)	46,700	2,300	6,800	20,000	9,000	8,500
All employment sectors	100	100	100	100	100	100
Education	76	85	81	79	71	72
For-profit or nonprofit	12	10	9	11	14	16
Government	11	6	10	10	16	10
Other	*	*	*	*	*	3
5.1–25.0 (number)	148,500	5,200	14,000	67,500	35,700	26,100
All employment sectors	100	100	100	100	100	100
Education	72	82	74	75	72	61
For-profit or nonprofit	13	9	8	11	10	24
Government	13	7	16	12	17	10
Other	2	2	1	*	*	5
25.1 or more (number)	72,100	2,600	5,300	29,100	23,300	11,900
All employment sectors	100	100	100	100	100	100
Education	78	83	75	80	80	71
For-profit or nonprofit	8	5	5	7	6	12
Government	12	10	17	11	13	12
Other	2	2	3	2	*	5

\* = value < 1.0%.

SEH = science, engineering, and health.

<sup>a</sup>Years since doctorate calculated by converting number of months between receipt of doctorate and survey reference date (1 April 2006) to decimal years.

<sup>b</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

TABLE 4. SEH doctorate recipients currently on postdocs reporting primary or secondary work activity as research and development or teaching: 2006 and 1995  
(Percent)

Survey year and primary or secondary work activity	All fields	Computer/mathematical sciences	Engineering	Life sciences <sup>a</sup>	Physical sciences	Social sciences, including psychology
<b>2006 (estimated population size)</b>						
Research and development	88	96	92	92	94	62
Teaching	9	41	4	5	6	23
<b>1995 (estimated population size)</b>						
Research and development	95	98	97	97	96	69
Teaching	10	40	4	8	8	19

SEH = science, engineering, and health.

<sup>a</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because multiple responses were allowed.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 1995 and 2006.

TABLE 5. Primary reason cited by SEH doctorate recipients for taking the current or most recent postdoc, by broad field of doctoral study: 2006

Primary reason	All fields	Computer/mathematical sciences	Engineering	Life sciences <sup>a</sup>	Physical sciences	Social sciences, including psychology
All SEH doctorate recipients with postdocs	267,300	10,100	26,100	116,600	68,000	46,500
	Percent distribution					
All reasons	100	100	100	100	100	100
Additional training in doctoral field	34	34	29	34	30	40
Work with specific person or place	19	25	24	20	19	16
Postdoc generally expected for career in this field	19	18	7	20	21	21
Training in area outside doctoral field	14	9	13	16	14	10
Other employment not available	11	10	23	8	14	9
Some other reason	3	4	4	3	3	4

SEH = science, engineering, and health.

<sup>a</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

disciplines.<sup>9</sup> The availability of both types of benefits to postdocs has increased steadily over the past several years, with about 90% of the most recent doctoral cohort members having health benefits and about 50% having retirement benefits (figure 2). Examination of the availability of benefits by broad field of doctoral study shows that social sciences doctorate recipients (including psychology) were the least likely to have both types of coverage (table 6).

### Employment Sector after the Postdoc

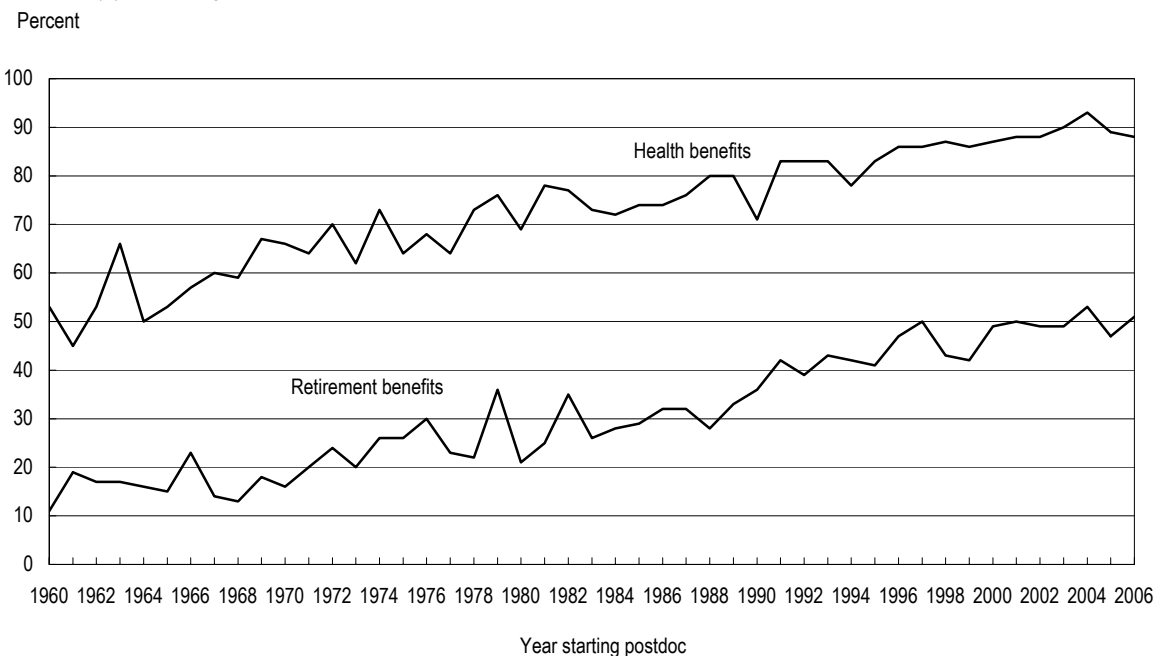
The SDR data also allow for examination of the employment sector where postdocs subsequently continue their careers. Do postdocs mainly transition into academic employment, or do they find employment in industry or government instead? How have the relative shares going to each employment sector changed over time? As a preliminary approach to these questions, the current (2006) employment sector for all who reported completing at least one postdoc is shown in table 7. As a general pattern, about half of all former postdocs were employed in the education sector (almost entirely university and college appointments) (49%), but a large number were employed in the business/industry sector (41%). These percentages were largely similar across the doctoral cohorts, thus not indicating any clear trends into or out of the three broad employment sectors.

### Data Comments and Availability

The SDR is a biennial survey of doctorates earned in science, engineering, and health fields at U.S. institutions. The focus of the survey is the labor force experiences of this population and how those experiences change over the course of individual careers and across historical cohorts. A special module of questions on past postdoctorate experiences in the 1995 SDR<sup>10</sup> was repeated in the 2006 SDR, and this InfoBrief focuses on the 2006 module. The 1995 and 2006 modules included questions on the total number of postdocs held and asked for detailed information on three past and present postdoc appointments, including employment sector of each postdoc, reasons for taking each postdoc, and availability of benefits. The full set of detailed tables from the 2006 SDR will be available in the forthcoming report *Characteristics of Doctoral Scientists and Engineers in the United States: 2006*, at <http://www.nsf.gov/statistics/doctoratework/>.

The 2006 SDR was administered to a nationally representative sample of about 40,000 SEH doctorate recipients from U.S. universities and who were residing in the United States. The sample frame for the SDR is built from the Doctorate Records File (DRF), a comprehensive list of all research doctorate recipients and their demographic characteristics from U.S. universities from 1920 to the present. Since 1958 the DRF has been

FIGURE 2. SEH doctorate recipients with health or retirement benefits in their current or most recent postdoc, by year starting postdoc: 2006



SEH = science, engineering, and health.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

TABLE 6. SEH doctorate recipients whose current or most recent postdoc employer provided health and retirement benefits, by years since doctorate and broad field of doctoral study: 2006

Years since doctorate and benefit type <sup>a</sup>	All fields	Computer/mathematical sciences	Engineering	Life sciences <sup>b</sup>	Physical sciences	Social sciences, including psychology
All SEH doctorate recipients with postdocs	267,300	10,100	26,100	116,600	68,000	46,500
Health (%)	79	86	80	83	80	68
Retirement (%)	37	50	43	38	37	32
5.0 years or less	46,700	2,300	6,800	20,000	9,000	8,500
Health (%)	91	92	91	95	92	83
Retirement (%)	50	64	58	49	55	41
5.1–25.0 years	148,500	5,200	14,000	67,500	35,700	26,100
Health (%)	82	86	81	85	84	70
Retirement (%)	40	50	43	40	43	33
25.1 years or more	72,100	2,600	5,300	29,100	23,300	11,900
Health (%)	65	79	63	68	68	52
Retirement (%)	23	36	23	24	21	23

SEH = science, engineering, and health.

<sup>a</sup>Years since doctorate calculated by converting number of months between receipt of doctorate and survey reference date (1 April 2006) to decimal years.

<sup>b</sup>Category includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

TABLE 7. Current employment sector of past SEH postdoc participants, by years since doctorate: 2006

Employment sector	Years since doctorate <sup>a</sup>						
	Total	5.0 or less	5.1–10.0	10.1–15.0	15.1–20.0	20.1–25.0	25.1 or more
Employed past postdoc holders	209,300	18,000	39,500	41,500	29,800	26,000	54,600
	Percent distribution						
All employment sectors	100	100	100	100	100	100	100
Business/industry	41	37	40	46	42	39	40
Government	9	9	8	8	9	12	9
Education	49	54	52	46	49	49	49

SEH = science, engineering, and health.

<sup>a</sup>Calculated by converting number of months between receipt of doctorate and survey reference date (1 April 2006) to decimal years.

NOTES: Estimates include those who have completed one or more postdocs, who are not currently on a postdoc, and who were employed in 2006. Numbers are rounded to nearest 100. Detail may not add to total because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients: 2006.

updated annually with data from the Survey of Earned Doctorates (SED), a census of new doctorate recipients sponsored by NSF and five other federal agencies. The SDR sample is augmented every 2 years with members of the new U.S. doctoral cohorts surveyed by the SED, and sample members are retired from the study after age 75. In 2006 the SDR had a response rate of 78%.

For further information on this report or the SDR, contact Nirmala Kannankutty (Human Resources Statistics Program, Division of Science Resources Statistics, NSF, 4201 Wilson Boulevard, Suite 965, Arlington VA 22230; nkannank@nsf.gov; 703-292-7797).

**Notes**

1. Thomas B. Hoffer is a principal research scientist, Karen Grigorian is a senior survey director, and Eric Hedberg is a research assistant at the National Opinion Research Center at the University of Chicago.
2. *Most recent doctorate recipients* are defined as those who earned their degrees within the 5 years preceding the survey reference date.
3. All differences stated in this InfoBrief are significant at the 95% level.
4. The broad category *life sciences* includes doctorates earned in biological, agricultural, or environmental life sciences, as well as those earned in health fields.
5. The time-since-doctorate variable was calculated by converting the number of months between receipt of the

doctorate and the SDR reference date (1 April 2006) into decimal years.

6. Among all doctorate recipients in 2006, 28% reported having had or currently working in just one postdoc, 8% reported having had two postdocs, and 2% three or more. Multiple postdocs were more often reported by life sciences (17%) and physical sciences (12%) doctorate recipients.
7. National Science Foundation, Division of Science Resources Statistics. 1998. *Has the Use of Postdocs Changed?* Issue Brief NSF 99-310. Arlington, VA. Available at <http://www.nsf.gov/statistics/issuebrf/ib99310.htm>.
8. Commission on Professionals in Science and Technology (CPST). 2002. *Postdocs: What We Know and What We Would Like to Learn*. Proceedings of an NSF/CPST Professional Societies Workshop, 4 December 2002. Washington, DC. Available at <http://www.cpst.org/Postdoc.pdf>. Accessed November 2007.
9. Committee on Science, Engineering, and Public Policy, National Academies. 2000. *Enhancing the Postdoctoral Experience for Scientists and Engineers*. Washington, DC: National Academy Press. Available at <http://www.nap.edu/books/0309069963/html/>. Accessed November 2007.
10. National Science Board (NSB). 1998. *Science and Engineering Indicators: 1998*. Vol. 1, chap. 3. NSB 98-01. Arlington, VA: National Science Foundation. Available at <http://www.nsf.gov/statistics/seind98/>.

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