



National Center for Science and
Engineering Statistics

InfoBrief

Early Career Doctorates in Context

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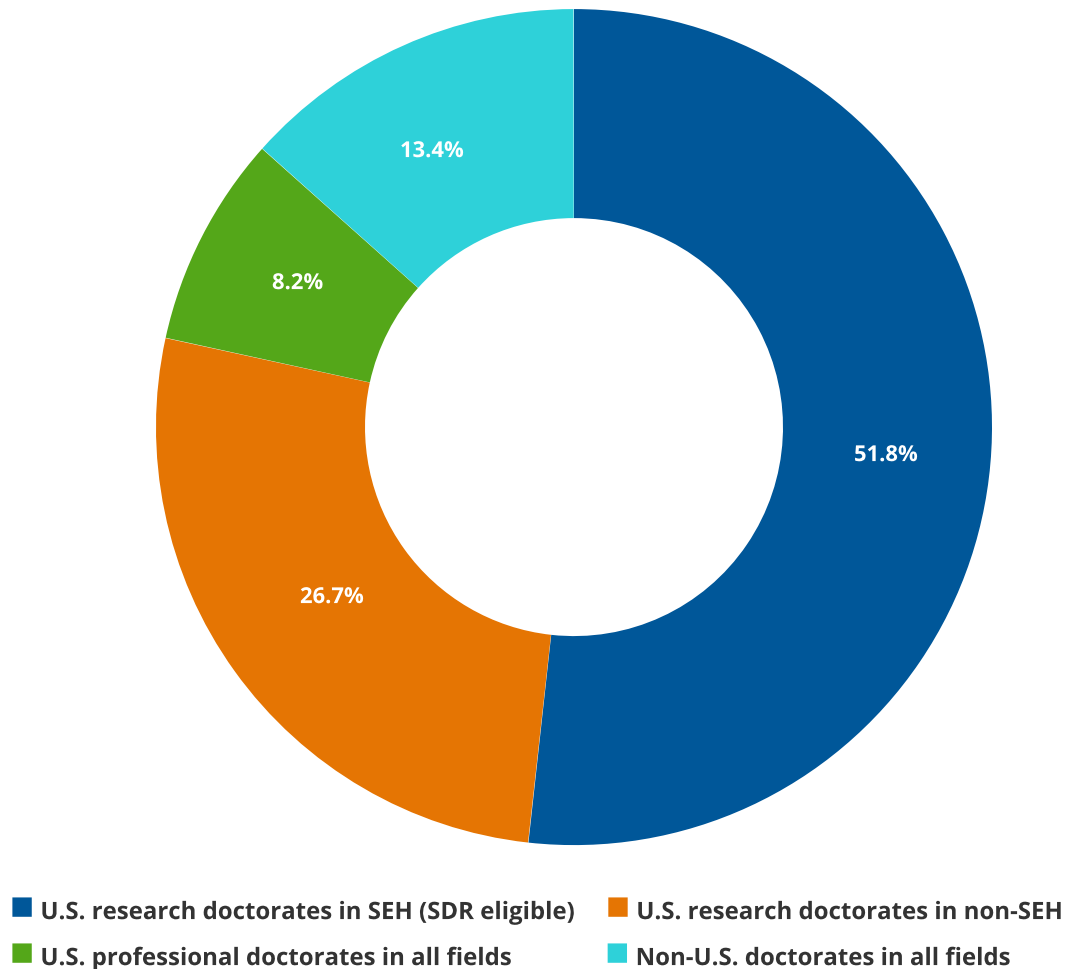
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Introduction

The first 10 years after earning a doctoral degree are crucial to the careers of doctorate holders. Although their pathways and timelines vary, doctorate recipients make a transition during this time from training to independent careers in research, teaching, clinical practice, or other areas. Despite the importance of this population for the growth and success of the global research enterprise, data collected about early career doctorates—persons receiving their first doctorate within the past 10 years—are sparse and have significant limitations. For example, the Survey of Doctorate Recipients (SDR), the best current source for data on doctoral careers, is limited to individuals who received research doctorates in science, engineering, and health (SEH) fields from academic institutions in the United States. The SDR excludes individuals who earned research doctorates from academic institutions outside the United States; those with doctorates in non-SEH fields including business, education, arts, and humanities; and those with professional doctoral degrees.

The National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) established the Early Career Doctorates Survey (ECDS) to address these limitations and respond to requests for more information on two key early career doctorate populations: postdoctoral researchers (postdocs) and individuals working in the United States who earned their doctoral degrees abroad. Cosponsored by the National Institutes of Health (NIH), the 2017 ECDS public data include responses from almost 9,000 individuals working in U.S. academic institutions (excluding medical schools and centers) and federally funded research and development centers (FFRDCs) who earned their first doctorate or doctoral-equivalent degree, regardless of field, between July 2007 and June 2017. By collecting in-depth information about these individuals' educational and work histories, the 2017 ECDS improves national statistics on postdocs and other early career doctorates and increases understanding of the characteristics and contexts of their work experiences.

In 2017, an estimated 186,700 early career doctorates were working in U.S. academic institutions (excluding medical schools and centers) and FFRDCs. Of these, about half (51.8%) held research doctorates in SEH fields from U.S. institutions, a quarter (26.7%) had research doctorates in non-SEH fields from U.S. institutions, 8.2% earned professional doctorates in the United States, and 13.4% earned their doctorate or equivalent abroad ([figure 1](#)). The latter three groups are not eligible for the SDR, highlighting the breadth of the ECDS sample and the new opportunities for analysis by origin, field, and type of doctoral degree. Because the ECDS population includes all individuals who earned their first doctorate or doctoral-equivalent degree in the past 10 years, the survey also enables comparisons across position type (e.g., postdocs, faculty, nonfaculty researchers, and administrative staff).

Figure 1**Early career doctorates, by origin, type, and field of doctoral degree: 2017**

SDR = Survey of Doctorate Recipients. SEH = science, engineering, and health.

Note(s):

Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Postdoctoral Researchers

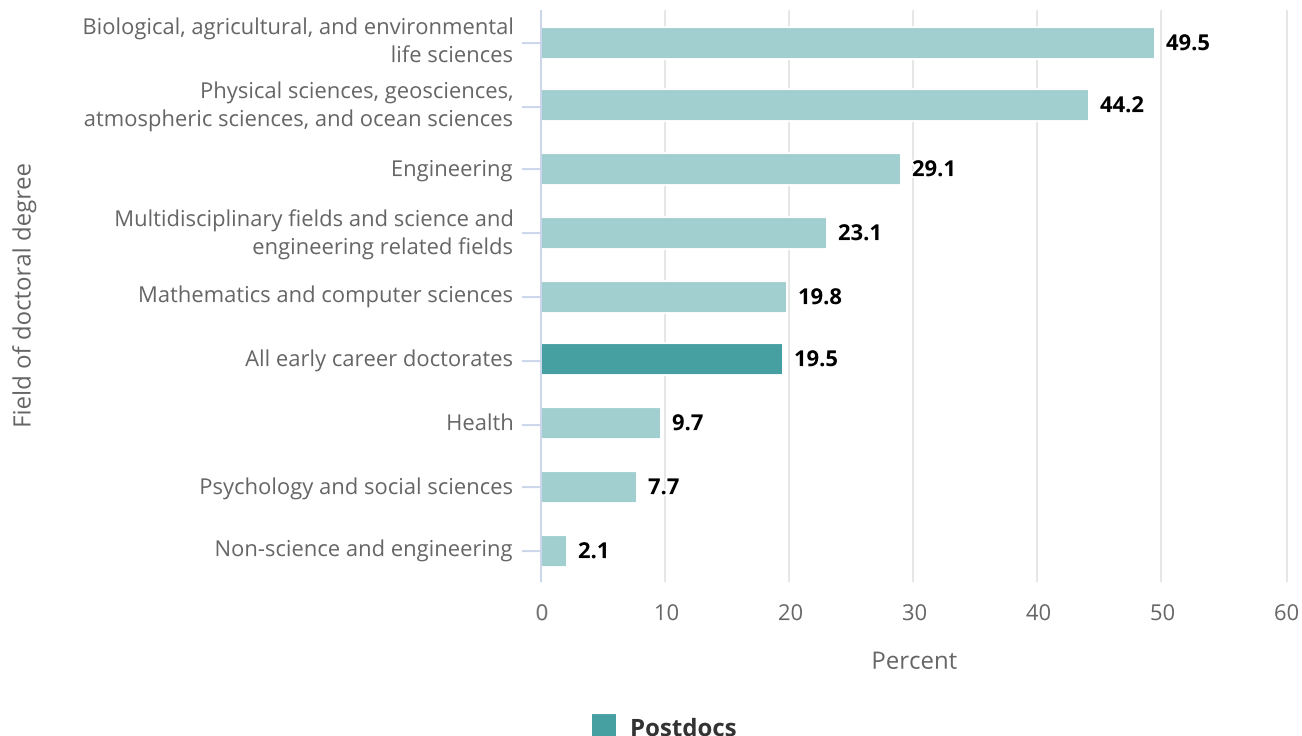
A key goal of the 2017 ECDS was to enhance national statistics on postdocs. Postdocs are important members of the U.S. research enterprise, yet efforts to collect nationally representative data on postdocs at the individual level have proved difficult because of the substantial variation in how institutions characterize and report postdoctoral appointments.¹ A postdoctoral appointment, or "postdoc," is defined as a temporary position awarded in academe, industry, government, or a nonprofit organization primarily for gaining additional education and training in research. Concerns over the quality of the postdoc experience have mounted with the rise in the overall number of postdocs employed in academia and the perception that postdoc appointments are increasingly required to attain faculty or full-time research positions in several fields.²

The ECDS achieves this goal and collects the most comprehensive data on postdocs to date through key aspects of the multistage survey design. First, the ECDS is a nationally representative stratified sample of academic institutions (excluding medical schools and centers) that grant SEH degrees and of FFRDCs. The first stage collects information such as postdoc status and citizenship that is used to increase the efficiency and effectiveness of the second-stage sample of early career doctorates. The second-stage sample includes early career doctorates from all fields across the years during which this group tends to hold a postdoc. Second, the ECDS collected in-depth information about three possible positions: the job held on the reference date at the sampled institution, the first position held after doctoral award (if different from the reference date position), and the first postdoc position (if neither the reference nor the first position was a postdoc and the early career doctorate reported having held a postdoc position). Third, detailed information about each position including job title, rank and tenure status, job activities, and whether the early career doctorate considered their position a postdoc yielded a more accurate classification than other surveys did.³ Responses to survey items on job characteristics (including salary, benefits, training, work activities, and supervisor/mentor relations) will enable researchers to assess the quality of postdoc and other types of early career doctorate positions.

In 2017, 1 of every 5 early career doctorates (19.5%) working in U.S. academic institutions and FFRDCs was a postdoc (figure 2). However, the proportion of early career doctorates who held postdoc positions varied widely by field. About half (49.5%) of early career doctorates with doctoral degrees in biological, agricultural, and environmental life sciences were postdocs at the time of the survey, whereas only 2.1% of early career doctorates with non-science and engineering (non-S&E) doctoral degrees were postdocs.

Figure 2

Early career doctorates who are postdocs, by field of doctoral degree: 2017



Note(s):

Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Overall, 44.0% of early career doctorates have held at least one postdoc, and 40.5% of early career doctorates reported that postdocs are very or extremely important for career development in their fields (table 1). About three-quarters of early career doctorates with doctoral degrees in biological and biomedical sciences (75.1%) and in physical sciences, geosciences, atmospheric sciences, and ocean sciences (74.8%) viewed postdocs as extremely or very important for career development, which highlights the centrality of postdocs in these fields. These data are consistent with previously collected data showing the prevalence of postdocs within the biological and physical sciences and provide new data on the prevalence of these positions within the health and non-S&E fields.⁴ These data also underscore key differences in career pathways of doctorate recipients by discipline.

Table 1**Importance of holding a postdoc to early career doctorates, by origin of doctoral degree, postdoc status, and field of doctoral degree: 2017**

(Number)

Selected characteristic	Early career doctorates	Importance of postdoc for career development			Undecided on career track
		Extremely or very important	Moderately or slightly important	Not important	
All early career doctorates	186,700	75,600	55,200	49,600	6,400
Origin of doctoral degree					
U.S. doctorate	161,800	57,300	51,200	48,000	5,400
Non-U.S. doctorate	24,900	18,300	4,000	1,600	1,000
Postdoc status					
Did not report a postdoc	104,600	15,400	38,000	47,500	3,700
Ever held a postdoc	82,200	60,200	17,100	2,100	2,700
Sample position is a postdoc	36,400	28,300	5,600	700	1,900
Sample position is not a postdoc	45,700	31,800	11,600	1,500	900
Field of doctoral degree					
Science and engineering	112,600	61,400	30,900	16,500	3,800
Biological, agricultural, and environmental life sciences	28,900	20,900	5,200	1,500	1,300
Agricultural and environmental life sciences	3,900	2,300	1,200	200	300
Biological and biomedical sciences	24,900	18,700	4,000	1,300	1,000
Engineering	17,200	8,500	5,800	2,400	600
Mathematics and computer sciences	12,100	5,500	3,800	2,400	400
Computer and information sciences	5,900	2,100	2,000	1,600	200
Mathematics and statistics	6,200	3,400	1,900	800	S
Multidisciplinary fields and science and engineering related fields	2,600	1,600	500	500	D
Physical sciences, geosciences, atmospheric sciences, and ocean sciences	20,600	15,400	3,300	1,300	600
Psychology and social sciences	31,200	9,500	12,300	8,400	1,000
Psychology	8,700	4,400	2,700	1,400	200
Social sciences	22,400	5,100	9,600	7,000	700
Health	13,400	4,500	4,200	4,300	500
Non-science and engineering	60,700	9,700	20,100	28,900	2,100
Education	21,100	3,200	5,900	11,100	900
Humanities	15,700	3,000	6,700	5,300	700
Other non-science and engineering	23,900	3,500	7,500	12,500	500

D = suppressed to avoid disclosure of confidential information. S = suppressed for reliability; coefficient of variation exceeds publication standards.

Note(s):

Counts are rounded to the nearest 100. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Although almost all early career doctorates currently in postdoc positions had research doctorates and were within 5 years of receiving their degree, approximately 1 in 12 (8.0%) were more than 5 years out from their doctoral award, and 1 out of every 50 (1.9%) held a professional doctorate (table 2). Current postdocs also varied demographically from early career doctorates in other types of positions, being younger (54.0% of postdocs were 32 years old or younger) and disproportionately Asian (38.8%) and male (63.7%).

Perhaps the most distinguishing feature of postdocs as a group was their distribution by citizenship: one-half (51.2%) of postdocs held temporary visas in 2017. Research scientists and nonfaculty researchers had the next-highest proportion of temporary visa holders at 17.4%. The high proportion of foreign postdocs drives the demographic distributions observed above because early career doctorates who were temporary visa holders were disproportionately male (11.3%) rather than female (5.1%).

Table 2**Position type of early career doctorates, by selected doctoral degree characteristics and demographic characteristics: 2017**

(Number and percent distribution)

Selected characteristic	All early career doctorates	Position type								
		Faculty					Postdoctoral scholar ^b	Other position		
		Total	Tenured faculty	Tenure-track faculty	Non-tenure track faculty with rank	Other faculty, no rank or tenure ^a		Total	Research scientist or nonfaculty researcher	All other positions ^c
Number of early career doctorates	186,700	125,600	27,300	58,500	13,000	26,800	36,400	24,700	10,900	13,800
Origin of doctoral degree										
U.S. degree	86.6	93.5	95.7	92.7	89.9	94.5	62.1	88.3	77.5	96.9
Non-U.S. degree	13.4	6.5	4.3	7.3	10.1	5.5	37.9	11.7	22.5	3.1
Doctoral degree type										
Professional degree or doctoral equivalent ^d	8.4	8.3	3.6	3.4	22.2	16.9	1.9	18.6	1.4	32.2
Research degree	91.6	91.7	96.4	96.6	77.8	83.1	98.1	81.4	98.6	67.8
Years since doctoral degree										
Less than 2 years	19.8	14.0	1.5	16.5	14.4	20.8	43.4	14.5	11.2	17.1
2–5 years	44.3	43.4	17.0	54.5	45.9	44.7	48.6	42.9	44.1	42.0
6–10 years	35.9	42.7	81.5	28.9	39.7	34.5	8.0	42.6	44.7	41.0
Sex										
Female	47.9	51.2	46.4	48.6	60.8	57.0	36.3	48.4	33.2	60.4
Male	52.1	48.8	53.6	51.4	39.2	43.0	63.7	51.6	66.8	39.6
Citizenship and sex										
U.S. citizen or permanent resident	83.6	92.4	98.0	88.9	92.6	94.2	48.8	90.4	82.6	96.6

Table 2**Position type of early career doctorates, by selected doctoral degree characteristics and demographic characteristics: 2017**

(Number and percent distribution)

Selected characteristic	All early career doctorates	Position type									
		Faculty						Postdoctoral scholar ^b	Other position		
		Total	Tenured faculty	Tenure-track faculty	Non-tenure track faculty with rank	Other faculty, no rank or tenure ^a	Total		Research scientist or nonfaculty researcher	All other positions ^c	
Female	42.8	48.3	45.7	44.4	58.6	54.6	22.0	45.1	27.0	59.6	
Male	40.8	44.1	52.3	44.5	33.9	39.6	26.8	45.3	55.6	37.1	
Temporary visa holder	16.4	7.6	2.0	11.1	7.4	5.8	51.2	9.6	17.4	3.4	
Female	5.1	2.8	0.7	4.2	2.1	2.4	14.3	3.2	6.3	0.8	
Male	11.3	4.8	1.3	6.9	5.3	3.4	36.9	6.4	11.2	2.6	
Ethnicity and race											
Hispanic or Latino ^e	7.3	7.4	6.4	8.1	7.0	7.2	8.5	4.5	3.0	5.7	
Not Hispanic or Latino											
Asian	20.1	15.4	15.1	18.7	14.9	9.0	38.8	16.4	28.2	7.0	
Black or African American	5.4	6.0	4.5	5.5	7.4	7.9	2.2	7.1	2.5	10.8	
White	64.7	68.4	72.1	64.8	69.4	72.2	49.2	68.7	63.8	72.5	
Other ethnicity and race	2.5	2.7	1.9	2.9	1.3	3.7	1.3	3.3	2.5	3.9	
Age quartile											
32 years or younger	20.6	12.2	1.0	18.2	12.5	10.3	54.0	14.0	19.9	9.3	
33–35 years	27.4	26.9	17.7	35.2	22.8	20.0	30.8	24.7	33.1	17.9	
36–40 years	22.4	25.8	33.2	25.7	21.2	20.5	10.2	23.6	26.8	21.1	
41 years or older	29.6	35.2	48.2	20.9	43.5	49.1	5.0	37.8	20.2	51.7	

^a Other faculty, no rank or tenure includes all other faculty positions such as instructors, lecturers, and adjuncts.

^b Postdoctoral scholar positions are temporary positions in academe, industry, government, or a nonprofit organization primarily for gaining additional education and training in research.

^c All other positions are diverse but are typically university administrators and staff.

^d Includes medical and related degrees, such as Medical Doctor (MD), Doctor of Pharmacy (PharmD), and other professional degrees such as Doctor of Education (EdD).

^e Hispanic or Latino may be any race; race categories exclude Hispanic origin.

Note(s):

Counts are rounded to the nearest 100. Percentages are calculated from unrounded numbers and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

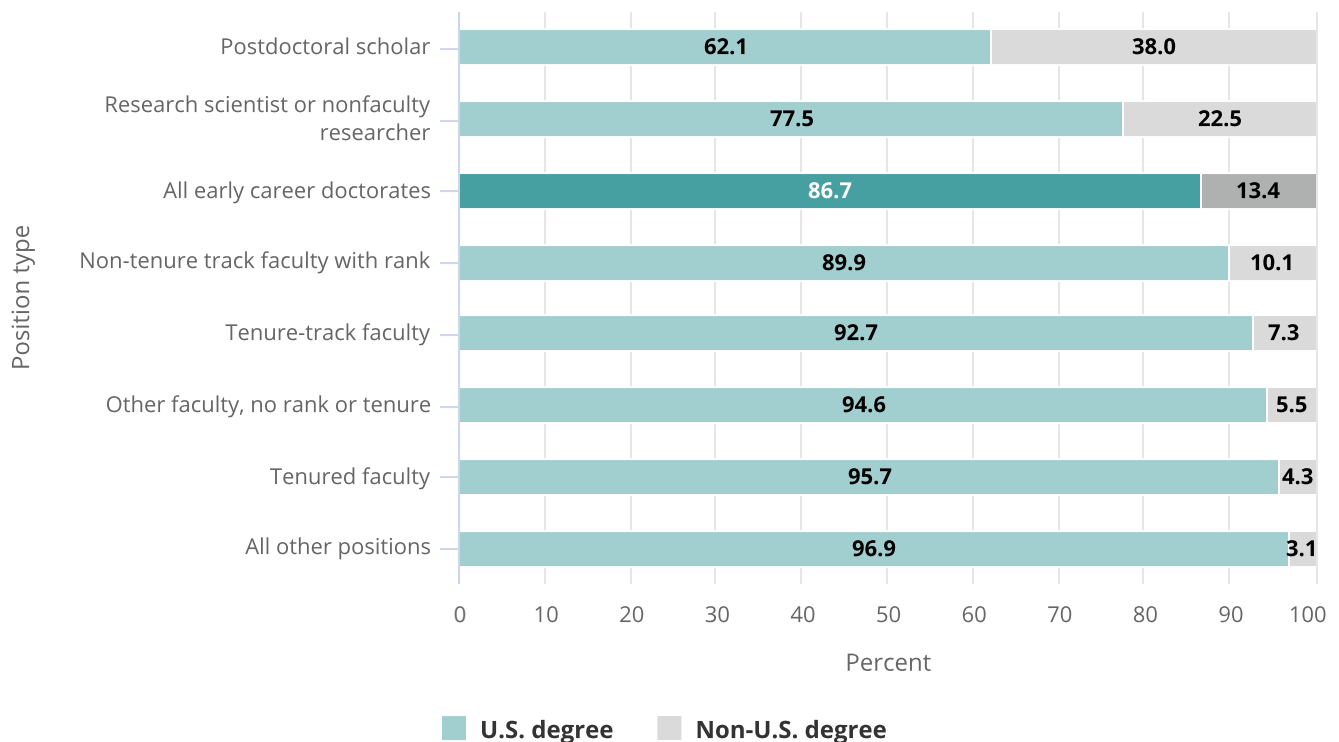
Origin of Doctoral Degree

Another key goal of the ECDS was to determine how many early career doctorates working in the United States received their doctoral or doctoral-equivalent degrees from academic institutions outside the United States. The ECDS provides new, richer information about foreign-trained doctorates across positions and fields. These data are valuable for understanding the roles foreign doctorates play in the U.S. research enterprise and how their work experiences differ from those of U.S.-trained early career doctorates.

Non-U.S. doctoral degrees were most common among postdocs, with 38.0% of postdocs earning their doctorate or equivalent abroad (figure 3). About a quarter (22.5%) of research scientists and nonfaculty researchers had doctorates from foreign institutions and were the only other position type to be above the overall average of 13.4% of early career doctorates with foreign doctoral degrees. Tenured faculty and early career doctorates in the “All other positions” category, which includes university administrators and other non-academic positions, had the lowest proportion of doctorates earned abroad (at 4.3% and 3.1%, respectively).

Figure 3

Early career doctorates who earned doctorates in the United States and abroad, by position type: 2017



Note(s):

Postdoctoral scholar positions are temporary positions in academe, industry, government, or a nonprofit organization primarily for gaining additional education and training in research. Other faculty, no rank or tenure includes all other faculty positions such as instructors, lecturers, and adjuncts. All other positions are diverse but are typically university administrators and staff. Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

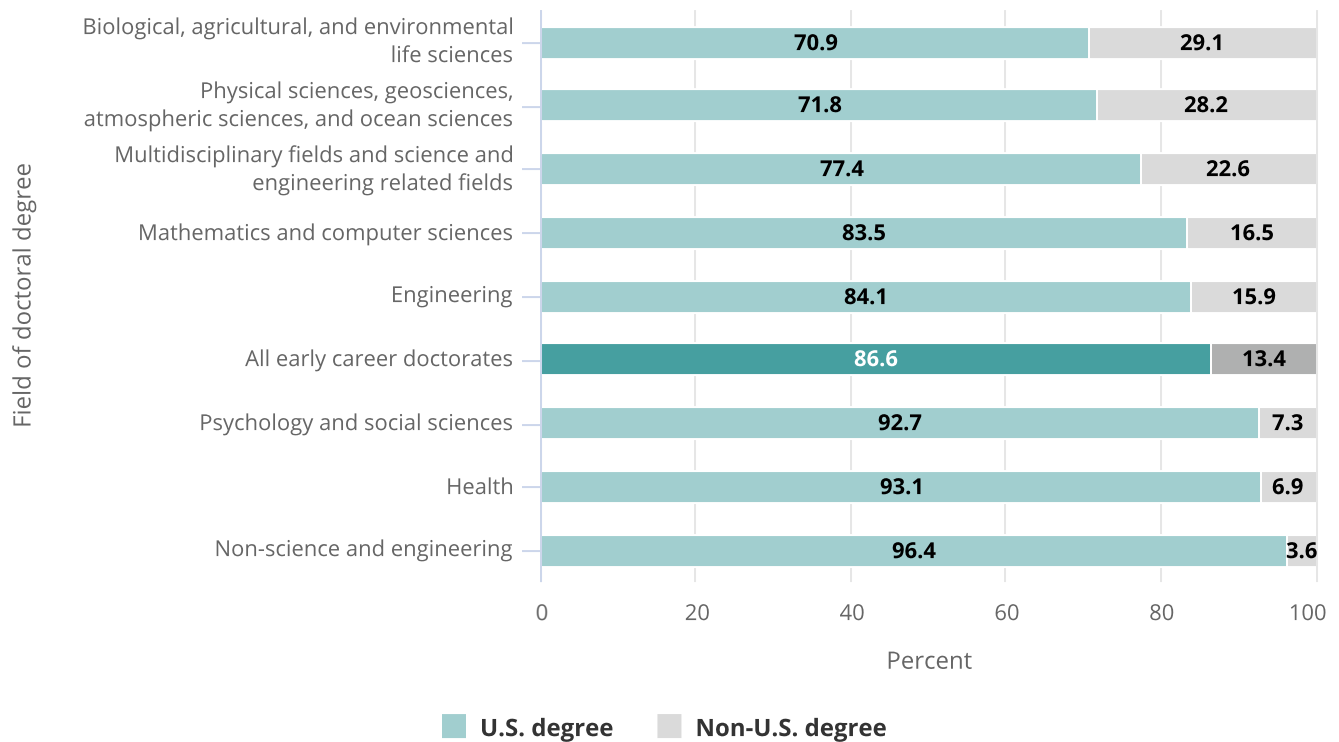
Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Similar differences exist across fields, with almost a third (29.1%) of early career doctorates with doctorates in biological, agricultural, and environmental life sciences having earned their doctoral degrees abroad, whereas fewer than 1 in 20 (3.6%) of early career doctorates with doctoral degrees in non-S&E fields had foreign doctorates (figure 4). Generally, the fields with the higher percentages of early career doctorates with foreign doctoral degrees have larger percentages of early career doctorates who are postdocs, although this relationship is not uniform across fields of study. In particular, early career doctorate holders with an engineering degree were much less likely to have a foreign doctorate (15.9%) than to be a postdoc (29.1%).

Figure 4

Early career doctorates who earned doctorates in the United States and abroad, by field of doctoral degree: 2017



Note(s):

Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Demographics of Early Career Doctorates

Because the ECDS population differs from the populations in other NCSES surveys, the demographic information in the ECDS provides insights about the representation of women and historically underrepresented minorities across fields and positions. The demographic data in the ECDS also include age, years since degree, and immigration status—specifically whether an early career doctorate is a citizen or permanent resident or a temporary visa holder. Taken together, this information provides a portrait of the variation in early career doctorates working in different positions and their work experiences.

Like postdocs, a greater proportion of early career doctorates overall were male (52.1%) rather than female (47.9%) in 2017 ([table 2](#)). Men also comprised the majority of postdocs (63.7%) and research scientists and nonfaculty researchers (66.8%). Conversely, women held the majority of non-tenure track faculty positions with rank (60.8%), faculty positions with no rank or tenure (57.0%), and jobs in the “All other positions” category (60.4%).

Overall, 64.7% of early career doctorates in 2017 identified as White. This group represented 68.4% of faculty and 72.1% of tenured faculty. Of early career doctorates, 7.3% identified as Hispanic or Latino, and 5.4% identified as Black or African American. Hispanic or Latino early career doctorates were represented similarly across faculty positions and postdocs and were less represented in other positions. Black or African American early career doctorates disproportionately held jobs in the “All other positions” category (10.8%) and were less represented in postdoc positions (2.2%). Asians accounted for 20.1% of all early career doctorates in 2017 and were better represented among postdocs (38.8%) and research scientists and nonfaculty researchers (28.2%).

Approximately 1 in 6 early career doctorates (16.4%) were in the United States on temporary visas. This rate is higher than the 4.5% of doctorate holders in the 2017 SDR who were temporary visa holders.⁵ This is not surprising given the younger population in the ECDS and the inclusion of early career doctorates with foreign doctoral degrees. Half (51.2%) of postdocs were temporary visa holders. Although 7.6% of all faculty positions were held by temporary visa holders, 11.1% of all tenure-track faculty positions were held by temporary visa holders.

As a group, tenured faculty were the furthest removed from their doctoral studies than other positions (81.5% of early career doctorates with tenure were 6 to 10 years out from their doctorate) and tended to be older (48.2% of tenured faculty were 41 years old or older). This is consistent with expectations because tenured faculty typically spend 5 to 7 years in tenure-track positions before earning tenure. Of note, many early career doctorates did not consider changes in tenure status to indicate changes in position; thus, it was not uncommon for early career doctorates with tenure to have indicated that they had held only one position since earning their doctorate. A greater proportion of postdocs were within 2 years of their degree (43.4%) and were the youngest group by position type, with 54.0% being 32 years old or younger and only 5.0% being older than 40.

Field of Doctoral Degree

A key strength of the ECDS design was to include doctoral and doctoral-equivalent recipients in all fields as opposed to focusing only on SEH fields. This provides a broader view of the experiences of early career doctorates and of the U.S. research enterprise more generally. It is also important because of the larger interest in interdisciplinarity (convergence) in fields and research, because interdisciplinary is within S&E fields and between S&E and non-S&E fields.⁶

As seen in [table 3](#) and [figure 5](#), 32.5% of early career doctorates earned their doctoral degrees in a non-S&E field, with 11.3% earning doctorates in education and 8.4% with doctoral degrees in the humanities. Within S&E fields, psychology and social sciences (16.7%) and biological, agricultural, and environmental life sciences (15.5%) were the largest broad degree fields. That almost one-third of the early career doctorates are in non-S&E fields illustrates the benefits of expanding the target population to include all fields when considering the impact of early career doctorates on the global research enterprise.

Table 3**Position type of early career doctorates, by field of doctoral degree: 2017**

(Number and percent distribution)

Selected characteristic	All early career doctorates	Position type								
		Faculty					Postdoctoral scholar ^b	Other position		
		Total	Tenured faculty	Tenure-track faculty	Non-tenure track faculty with rank	Other faculty, no rank or tenure ^a		Total	Research scientist or nonfaculty researcher	All other positions ^c
Number of early career doctorates	186,700	125,600	27,300	58,500	13,000	26,800	36,400	24,700	10,900	13,800
Field of doctoral degree										
Science and engineering	60.3	51.5	49.4	56.1	49.5	44.6	92.6	57.6	89.8	32.1
Biological, agricultural, and environmental life sciences	15.5	9.1	5.4	10.5	13.4	7.9	39.2	12.7	19.8	7.0
Agricultural and environmental life sciences	2.1	1.5	1.5	1.7	1.5	S	4.3	1.9	2.5	1.5
Biological and biomedical sciences	13.4	7.6	3.9	8.8	11.9	6.8	34.9	10.7	17.3	5.5
Engineering	9.2	7.3	7.3	8.8	6.0	4.5	13.8	12.5	22.6	4.5
Mathematics and computer sciences	6.5	6.7	7.6	7.3	6.0	4.7	6.5	5.5	8.9	S
Computer and information sciences	3.2	3.2	3.5	3.9	1.7	2.4	2.6	3.4	6.3	S
Mathematics and statistics	3.3	3.4	4.1	3.4	4.2	2.3	3.9	2.1	2.7	S
Multidisciplinary fields and science and engineering related fields	1.4	1.2	1.5	1.1	S	1.3	1.8	1.9	1.1	2.4
Physical sciences, geosciences, atmospheric sciences, and ocean sciences	11.0	6.7	3.9	7.3	8.3	7.3	24.9	13.0	25.9	2.8
Psychology and social sciences	16.7	20.6	23.7	21.1	14.8	19.0	6.5	12.0	11.4	12.5
Psychology	4.7	5.1	5.4	5.2	3.2	5.6	2.8	5.2	4.0	6.2
Social sciences	12.0	15.4	18.3	15.9	11.6	13.4	3.7	6.8	7.4	6.3
Health	7.2	8.1	5.3	6.7	22.7	7.1	3.7	7.4	1.6	12.1
Non-science and engineering	32.5	40.4	45.3	37.3	27.8	48.3	3.7	35.0	8.6	55.9
Education	11.3	11.8	10.4	8.6	14.2	19.2	1.1	23.5	2.7	40.1
Humanities	8.4	11.0	12.7	9.5	S	15.2	1.4	5.9	2.4	8.8
Other non-science and engineering	12.8	17.6	22.3	19.1	8.4	14.0	1.2	5.5	3.6	7.0

S = suppressed for reliability; coefficient of variation exceeds publication standards.

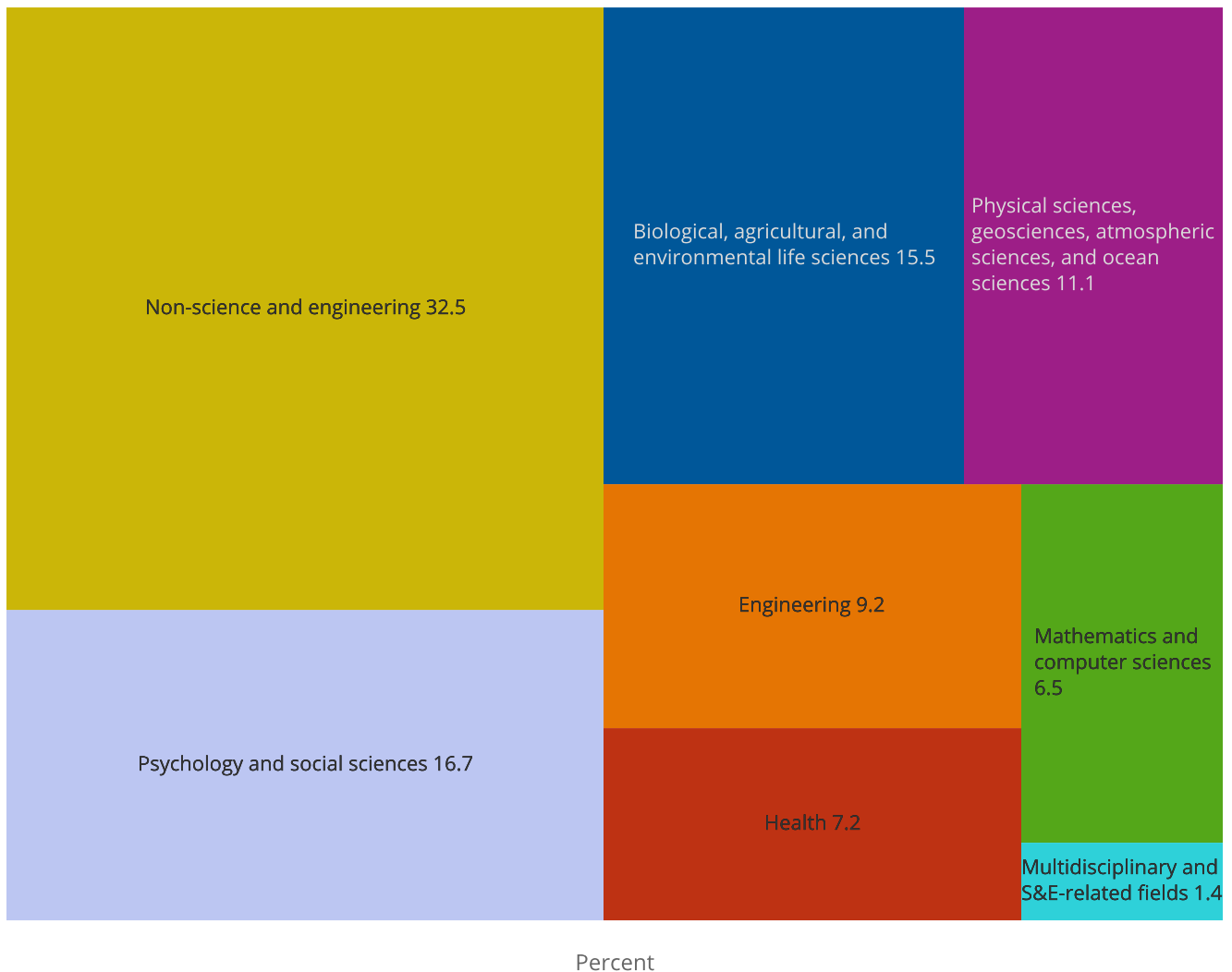
^a Other faculty, no rank or tenure includes all other faculty positions such as instructors, lecturers, and adjuncts.^b Postdoctoral scholar positions are temporary positions in academe, industry, government, or a nonprofit organization primarily for gaining additional education and training in research.^c All other positions are diverse but are typically university administrators and staff.

Note(s):

Counts are rounded to the nearest 100. Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Figure 5**Early career doctorates, by field of doctoral degree: 2017**

S&E = science and engineering.

Note(s):

Percentages are calculated from unrounded counts and rounded to the nearest 10th of a percent. Details may not add to totals because of rounding. Other faculty, no rank or tenure includes all other faculty positions such as instructors, lecturers, and adjuncts. Postdoctoral scholar positions are temporary positions in academe, industry, government, or a nonprofit organization primarily for gaining additional education and training in research. All other positions are diverse but are typically university administrators and staff.

Source(s):

National Center for Science and Engineering Statistics, Early Career Doctorates Survey, 2017.

Early career doctorates with doctoral degrees in non-S&E fields disproportionately held faculty positions: 40.4% of all early career doctorates with faculty positions in 2017 had doctorates in non-S&E fields, including 45.3% of tenured faculty and 48.3% of faculty without rank or tenure. Over half (55.9%) of early career doctorates in the “All other positions” category held doctorates in non-S&E fields. Proportionally, relatively few early career doctorates with doctoral degrees in these fields held postdoc positions or research scientist or nonfaculty researcher positions.

In contrast, almost three-quarters of postdocs (73.6%) and two-thirds of research scientists and nonfaculty researchers (65.8%) in 2017 had doctoral degrees in biological and biomedical sciences; physical sciences, geosciences, atmospheric sciences, and ocean sciences; or engineering. Although early career doctorates with biological and biomedical sciences doctorates comprise 13.4% of all early career doctorates, 8.8% of tenure-track faculty have doctoral degrees in this field.

Data Source

Conducted from October 2017 through February 2019, the ECDS focused on early career doctorates working in U.S. academic institutions (excluding medical schools and centers; see ECDS Technical Notes, which will be available in the upcoming set of data tables at <https://www.nsf.gov/statistics/srvyecd/#tabs-2>) and FFRDCs. The published numbers for the ECDS include 8,713 respondents from 197 academic institutions and FFRDCs. Given the substantial variation in how institutions characterize and report early career doctorate positions, the ECDS uses a broad definition for the target population that includes all individuals working in these institutions who earned their first doctoral degree within the 10-year period from 2007 to 2017. This approach provides useful comparison groups and more complete information about different early career pathways.

The NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS) served as the sampling frame for the U.S. academic institutions in the ECDS. A census of U.S. academic institutions that offer graduate degrees in science, engineering, and selected health fields, the GSS was chosen as the frame for the ECDS because the majority of postdocs work in these research-focused academic institutions. The FFRDC Master Government List maintained by NSF served as the sampling frame for the FFRDCs.⁷

Using a two-stage sample survey design, the ECDS first obtained lists of potential early career doctorates from sampled institutions, then used these lists as the sampling frame for the second-stage individual data collection.⁸ The stage 1 institutional sample focused on the sectors described earlier because those institutions are the largest employers of postdocs⁹ and early career doctorates with doctoral degrees earned outside the United States.

Topics Covered by the Survey

The ECDS questionnaire covered doctoral degree completion, demographics, educational history, professional activities (e.g., research, teaching, service activities, and work products), employment history (current position and up to two additional positions; includes questions on benefits), work-life balance, and career development and plans. The questions consisted of items used in current NCSES education and workforce surveys, as well as new items specific to this data collection and the early career doctorate population.

Additional Information and Limitations

The estimates in this InfoBrief are based on responses from a sample of the population and may differ from actual values because of sampling variability or other factors. As a result, apparent differences between the estimates for two or more groups may not be statistically significant. All comparative statements have undergone statistical testing and are significant at the 95% confidence level. In this InfoBrief, the variances of estimates were calculated using the jackknife replication method. These jackknife weights account for institutional and individual level nonresponse.

Additional data tables and analyses can be found at <https://www.nsf.gov/statistics/srvyecd/>. For more information on the technical elements of the survey, see the ECDS Technical Notes available in the upcoming set of data tables.

Notes

- 1 See the following two references: (1) Einaudi P, Heuer R, Green P; National Center for Science and Engineering Statistics. 2013. *Counts of Postdoctoral Appointees in Science, Engineering, and Health Rise with Reporting Improvements*. NSF 13-334. Arlington, VA: National Science Foundation. Available at <https://www.nsf.gov/statistics/infbrief/nsf13334/>. (2) Kahn S, Ginther DK. 2017. The impact of postdoctoral training on early careers in biomedicine. *Nature Biotechnology* 35:90–4.
- 2 National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. 2014. *The Arc of the Academic Research Career: Issues and Implications for U.S. Science and Engineering Leadership: Summary of a Workshop*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/18627>.
- 3 To be classified as a postdoc, an early career doctorate had to indicate that their position was a postdoc, did not have rank or tenure, and was focused on research or development.
- 4 See National Center for Science and Engineering Statistics. 2020. *Graduate Students and Postdoctorates in Science and Engineering: Fall 2018*. Table 1-9b. Alexandria, VA: National Science Foundation. Available at <https://ncesdata.nsf.gov/gradpostdoc/2018/html/gss18-dt-tab001-9b.html>.
- 5 See National Center for Science and Engineering Statistics. 2019. *Survey of Doctorate Recipients, 2017*. Table 9. Alexandria, VA: National Science Foundation. Available at https://ncesdata.nsf.gov/doctoratework/2017/html/sdr2017_dst_09.html.
- 6 For example, the National Academies of Sciences, Engineering and Medicine held a [workshop on convergence in 2020](#): The ECDS contains information for the secondary field of study; these data are available to researchers through restricted-use data licenses. For more information on restricted-use data, see <https://www.nsf.gov/statistics/license/>.
- 7 The FFRDC Master Government List used for sampling can be found at https://www.nsf.gov/statistics/ffrdclist/archive/ffrdc_2017.xlsx.
- 8 The first stage of the ECDS design was a stratified sample of institutions with academic institutions, FFRDCs, and the NIH Intramural Research Program (IRP) placed in separate strata. Within academic institutions, large universities with medical schools and centers were split into medical and nonmedical sampling units. Because of low response rates and the resulting potential for nonresponse bias in subpopulation estimates, data for the NIH IRP and the medical school and center strata are excluded from this InfoBrief.
- 9 For more data on postdoc counts, see National Center for Science and Engineering Statistics. 2016. *Higher Education Research and Development: Fiscal Year 2015*. Table 73. Arlington, VA: National Science Foundation. Available at https://ncesdata.nsf.gov/herd/2015/html/HERD2015_DST_73.html. Please note that the 2015 Higher Education Research and Development Survey was the last year the survey included postdoc data.

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