



NATIONAL SCIENCE FOUNDATION  
MARCH 2018

The background of the cover features a stylized bar chart with 12 vertical bars of varying heights, rendered in shades of purple and grey. Below the bars are several overlapping, wavy lines in various shades of purple, creating a dynamic, layered effect.

# 2016 DOCTORATE RECIPIENTS FROM U.S. UNIVERSITIES

NATIONAL CENTER FOR SCIENCE AND ENGINEERING STATISTICS  
DIRECTORATE FOR SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES

## ABOUT THIS REPORT

The Survey of Earned Doctorates, the data source for this report, is an annual census of individuals who receive research doctoral degrees from accredited U.S. academic institutions. The survey is sponsored by six federal agencies: National Science Foundation (NSF), National Institutes of Health, Department of Education, National Endowment for the Humanities, Department of Agriculture, and National Aeronautics and Space Administration. These data are reported in several publications from NSF's National Center for Science and Engineering Statistics. The most comprehensive and widely cited publication is this report, *Doctorate Recipients from U.S. Universities*.

This report calls attention to major trends in doctoral education, organized into themes highlighting important questions about doctorate recipients. Online, the reader is invited to explore trends in greater depth through detailed data tables and interactive graphics (<https://www.nsf.gov/statistics/sed/>). Technical notes and other online resources are provided to aid in interpreting the data. The data tables are available in HTML, PDF, and Excel formats for easy viewing, printing, and downloading.

# 2016

## DOCTORATE RECIPIENTS FROM U.S. UNIVERSITIES

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NATIONAL  
ENDOWMENT  
FOR THE  
HUMANITIES



National Center for Science and Engineering Statistics  
Directorate for Social, Behavioral and Economic Sciences

## WHY IS THIS IMPORTANT?

**T**he American system of doctoral education is widely considered to be among the world's best, as evidenced by the large and growing number of international students each year—many of them among the top students in their countries—who choose to pursue the doctoral degree at U.S. universities. But the continued preeminence of U.S. doctoral education is not assured. Other nations, recognizing the contributions doctorate recipients make to economies and cultures, are investing heavily in doctoral education. Unless doctoral education in the United States continues to improve, the world's brightest students, including U.S. citizens, may go elsewhere for the doctoral degree, and they may begin careers elsewhere as well. Monitoring the number of degrees awarded in science and engineering fields is an important part of the mission of the National Center for Science and Engineering Statistics within the National Science Foundation. The Survey of Earned Doctorates and this report contribute toward that goal.

Annual counts of doctorate recipients from U.S. universities are measures of the incremental investment in human resources devoted to science, engineering, research, and scholarship, and they can serve as leading indicators of the capacity for knowledge-creation and innovation in various domains. The changing characteristics of this population over time—including the increased representation of women, minorities, and foreign nationals; emergence of new fields of study; time it takes to complete doctoral study; expansion of the postdoctoral pool; reduced academic employment opportunities after graduation; and changed age distribution—reflect political, economic, social, technological, and demographic trends and events. Understanding the connections between these larger forces and the number and characteristics of doctorate recipients is necessary to make informed improvements in this country's doctoral education system.

Doctorate recipients begin careers in large and small organizations, teach in universities, and start new businesses. Doctoral education develops human resources that are critical to a nation's progress—scientists, engineers, researchers, and scholars who create and share new knowledge and new ways of thinking that lead, directly and indirectly, to innovative products, services, and works of art. In doing so, they contribute to a nation's economic growth, cultural development, and rising standard of living.

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# WHO EARNS A U.S. DOCTORATE?

Each new cohort of doctorate recipients augments the supply of prospective scientists, engineers, researchers, and scholars. Data on the demographic composition of these cohorts reveal changes in the presence of underrepresented groups.

## Overall Trends

The number of research doctorate degrees awarded by U.S. institutions in 2016 remained essentially unchanged at 54,904, slightly fewer than the 54,909 awarded in 2015, according to the Survey of Earned Doctorates (SED). Over time, the number of doctorates awarded shows a strong upward trend—average annual growth of 3.3%—punctuated by periods of slow growth and even decline.

Since the SED began collecting data in 1957, the number of research doctorates awarded in science and engineering (S&E) fields has exceeded the number of non-S&E doctorates, and the gap is widening as S&E fields make up a larger share of all research doctorates. From 1976 to 2016, the number of S&E doctorate recipients has more than doubled, with an average annual growth rate of 2.0%. However, the number of non-S&E doctorates awarded in 2016 is slightly lower than the 1976 count. The net result is that the proportion of S&E doctorates climbed from 57% in 1976 to 75% in 2016 (figure A).

## Citizenship

### OVERVIEW

The number of doctorates in S&E fields awarded to temporary visa holders grew to 14,333 in 2016, up 2% since 2015 and up 20% since 2006. In comparison, the number of S&E doctorates awarded to U.S. citizens and permanent residents also grew 2% since 2015 but experienced 39% growth since 2006.

In 1996, 29% of all S&E doctorates were awarded to temporary visa holders. The proportion of S&E doctorate recipients with temporary visas has held steady at around 36% since 2011, down from its peak at 41% in 2007 (figure B).

### COUNTRIES OR ECONOMIES OF FOREIGN CITIZENSHIP

The number of doctoral awards to temporary visa holders is highly concentrated in a few countries—10 countries accounted for 71% of the doctorates awarded from 2006 to 2016. The top three countries—China, India, and South Korea—accounted for over half (54%) of all temporary visa holders' doctoral awards (figure C).

## Sex

### CITIZENSHIP

Women have earned a slim majority of all doctorates awarded to U.S. citizens and permanent residents each year since 2002, and they have earned more than 30% of all doctorates awarded to temporary visa holders over that period. From 1996 to 2006, the share of female doctorate recipients grew from 45% to 51% among U.S. citizens and permanent residents, and from 23% to 34% among temporary visa holders. Since 2006, the shares of female doctorates in both citizenship categories have changed little. Overall, 46% of all doctorates in 2016 were awarded to women (figure D).

### FIELD OF STUDY

Most of the growth in the number of doctorates earned by both men and women has been in S&E fields. From 1996 to 2016, the number of female doctorate recipients in S&E fields increased by 84%, far faster than the 27% growth in the number of male S&E doctorates. Women's share of S&E doctorates awarded increased from 33% in 1996 to 42% in 2009, and it has remained stable since then.

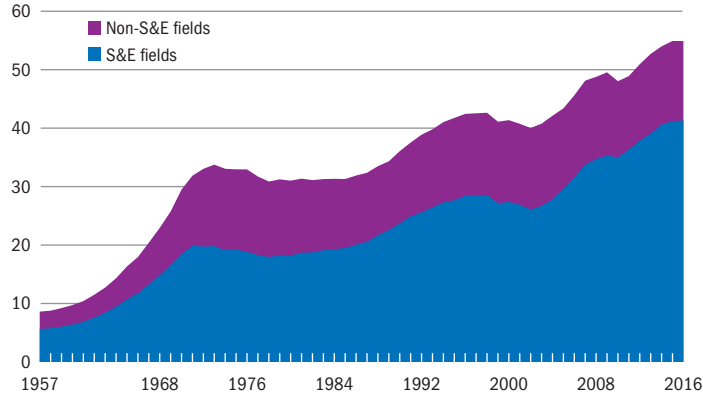
In non-S&E fields, 58% of doctorates were awarded to women in 2016, a share that has changed little since 2007. In fact, the number of female non-S&E doctorate recipients has slightly increased over the past 20 years, whereas the number of male doctorates in those fields has slightly declined (figure E).

## Race and Ethnicity

Participation in doctoral education by underrepresented minorities who are U.S. citizens or permanent residents is increasing. The number of doctorates awarded to blacks or African Americans increased by 32% from 2006 to 2016, and the number of Hispanic or Latino doctorate recipients increased by 67% over the same period. As a result, the proportion of doctorates earned by blacks or African Americans has risen slightly from 6% in 2006 to 7% in 2016, and the proportion awarded to Hispanics or Latinos has grown from 5% to 7%. The proportion of American Indian or Alaska Native doctorate recipients has been under 1% from 2006 to 2016 (figure F).

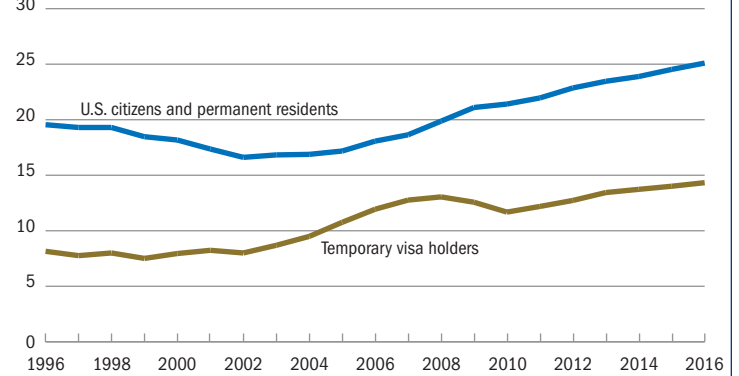
**A Doctorates awarded by U.S. colleges and universities: 1957–2016**

Doctorate recipients (thousands)



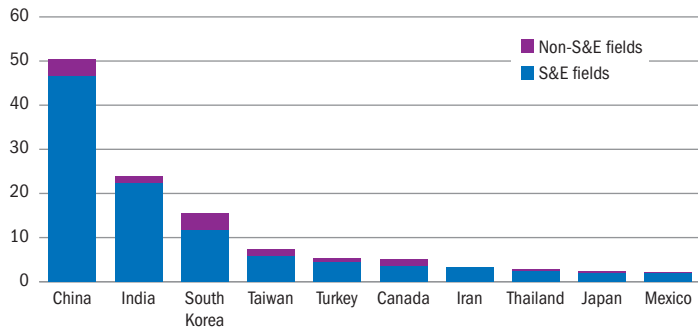
**B Doctorates awarded in science and engineering fields, by citizenship: 1996–2016**

S&E doctorate recipients (thousands)



**C Top 10 countries or economies of foreign citizenship for U.S. doctorate recipients with temporary visas: 2006–16**

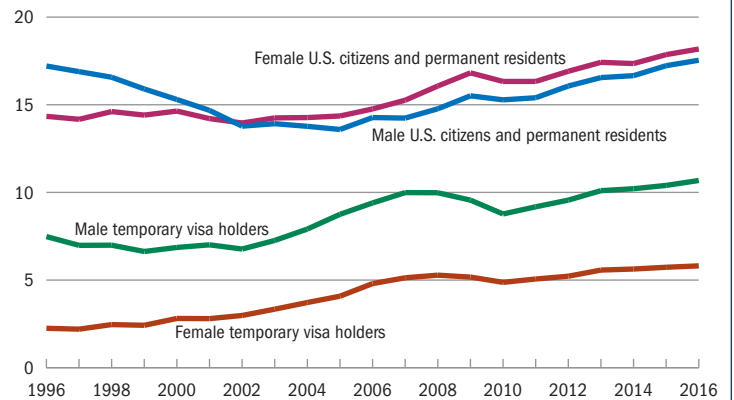
Doctorate recipients (thousands)



NOTE: China includes Hong Kong.

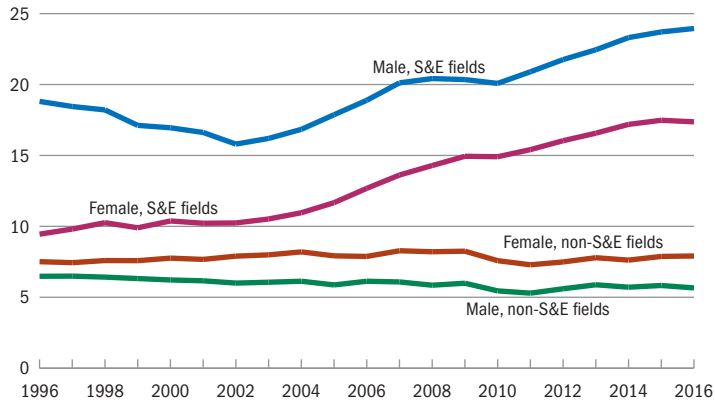
**D Sex and citizenship of U.S. doctorate recipients: 1996–2016**

Doctorate recipients (thousands)



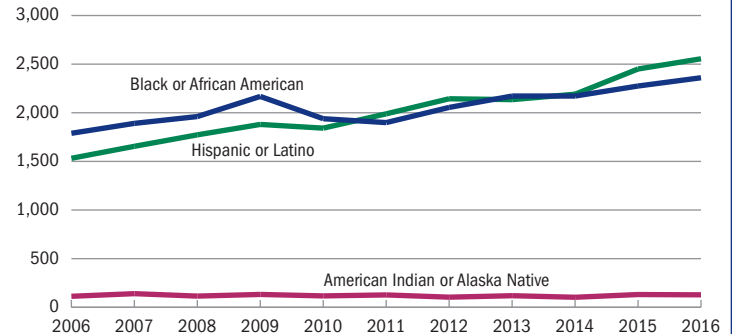
**E Sex and field of study of U.S. doctorate recipients: 1996–2016**

Doctorate recipients (thousands)



**F Doctorates earned by underrepresented minority U.S. citizens and permanent residents: 2006–16**

Doctorate recipients



NOTE: Hispanic or Latino may be any race.

## WHICH FIELDS ATTRACT STUDENTS?

As researchers expand their understanding of the world, new fields of study emerge and existing fields change. Observing which fields of study are attracting growing proportions of students can provide early insight into where future research breakthroughs may occur.

### Field Trends

#### SCIENCE AND ENGINEERING

Doctorates in science and engineering (S&E) fields are a growing share of all doctorates awarded. Overall, S&E doctorates accounted for 75% of all doctorates awarded in 2016, a substantially larger share than 10 and 20 years earlier (69% and 67%, respectively). Every broad S&E field except for psychology and social sciences increased both their number and share of doctorates over the past 2 decades. Psychology and social sciences increased in the number of doctorate recipients, but its share of all doctorates stayed about the same. Mathematics and computer sciences, with the smallest number of doctorates awarded among the S&E fields, almost doubled the number of doctorates awarded over the past 20 years, from 2,042 in 1996 to 3,957 in 2016 (figure A).

#### NON-SCIENCE AND ENGINEERING

Within non-S&E fields, the number of doctorates awarded in education has declined over the past 2 decades, leading to a large, steady drop in the relative share of doctorates in that field from 16% in 1996 to 9% in 2016. Despite an increase in the number of humanities and arts doctorates, the relative share of doctorates awarded in this field fell 2 percentage points from 1996 to 2016. The share of doctorates in other non-S&E fields, such as business management, has remained fairly stable over the past 2 decades (figure B).

### Temporary Visa Holders

In every broad field of study, the share of doctorates awarded to temporary visa holders increased over the past 20 years. In 2016, temporary visa holders earned the majority of doctorates awarded in engineering and in mathematics and computer sciences (figure C).

### Minority U.S. Citizens and Permanent Residents

Among minority U.S. citizens and permanent residents, doctorate recipients of different racial or ethnic backgrounds are more heavily represented in some fields of study than in others. In 2016, Asians

earned more doctorates than other racial and ethnic minority groups in life sciences (11%), physical sciences and earth sciences (8%), mathematics and computer sciences (13%), and engineering (15%). Blacks or African Americans were the largest U.S. minority population in education. Hispanics or Latinos earned a larger share of doctorates in psychology and social sciences and in humanities and arts than did any other minority group (figure D).

### Women

#### FIELD OF STUDY

Women's share of doctorates awarded has grown over the past 2 decades in all broad fields of study. In 2016, women earned the majority of doctorates awarded in life sciences (55%), psychology and social sciences (59%), education (70%), and humanities and arts (52%).

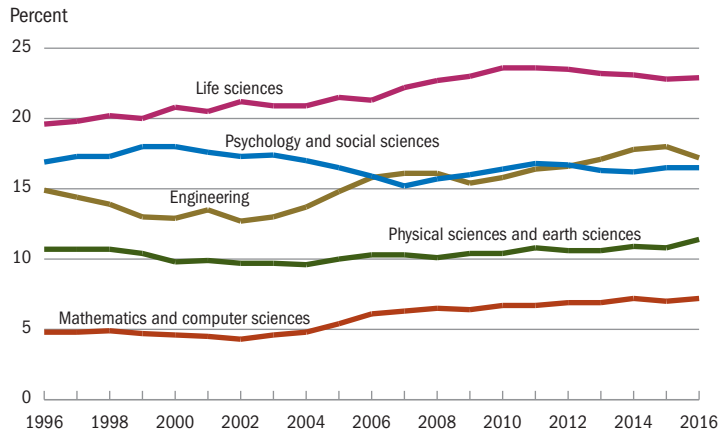
Although women earned less than one-third of the 2016 doctorates awarded in physical sciences and earth sciences and less than one-fourth of the doctorates in engineering, their relative shares of doctorates awarded in those fields has been growing rapidly. From 1996 to 2016, the share of doctorates in physical sciences and earth sciences awarded to women increased from 22% to 31%, and the share of women in engineering grew from 12% to 23%. The share of female doctorate recipients in mathematics and computer sciences grew, although more modestly, from 18% to 24% during this period (figure E).

#### GROWING SUBFIELDS

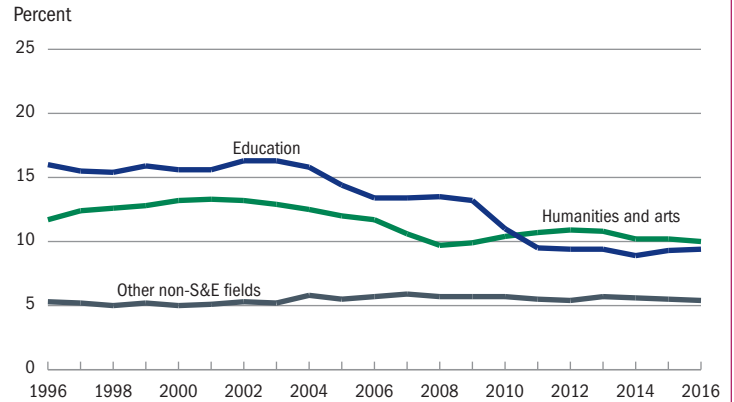
The subfields of doctoral study showing the largest relative growth in numbers of female doctorate recipients over the past decade have been in bioengineering and biomedical engineering (125%) and in aerospace, aeronautical, and astronautical engineering (124%). Geosciences, atmospheric, and ocean sciences also saw strong growth in the number of female recipients, with an increase of 92% between 2006 and 2016, followed by teaching fields with an increase of 86% (figure F).



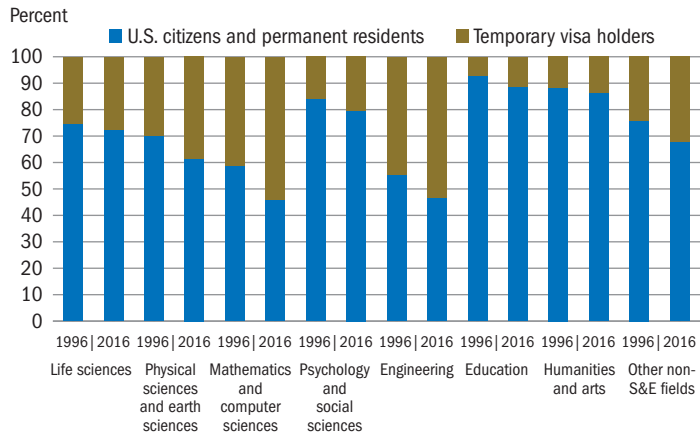
**A Doctorates awarded in science and engineering fields of study: 1996–2016**



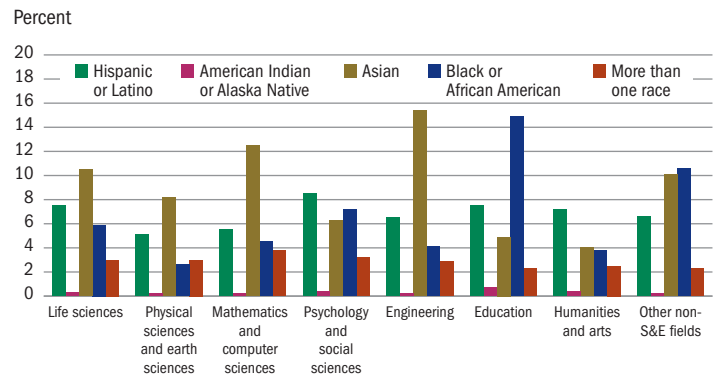
**B Doctorates awarded in non-science and engineering fields of study: 1996–2016**



**C Doctorates awarded, by citizenship and broad field of study: 1996 and 2016**

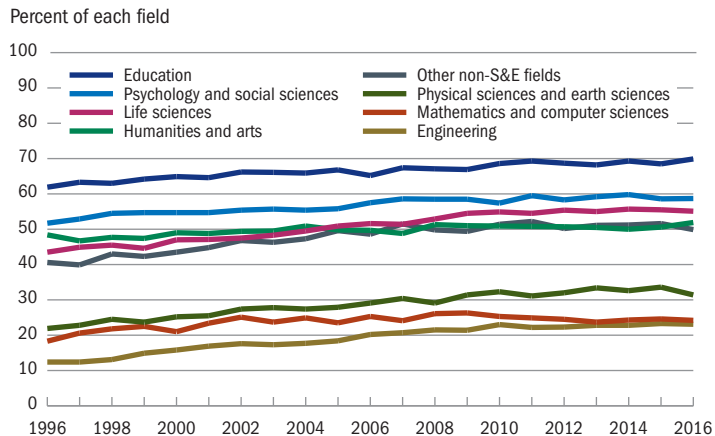


**D Doctorates awarded to minority U.S. citizens and permanent residents, by ethnicity, race, and broad field of study: 2016**

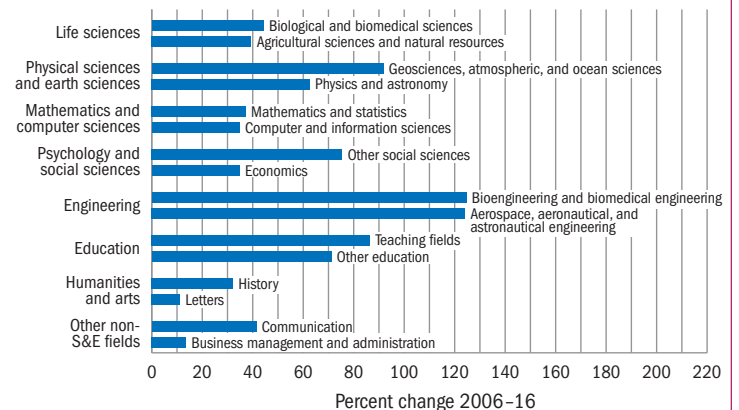


NOTE: Hispanic or Latino may be any race.

**E Share of doctorates awarded to women, by broad field of study: 1996–2016**



**F Fastest growing fields of study for female U.S. doctorate recipients, by broad field of study: 2006–16**



# WHAT INFLUENCES THE PATH TO THE DOCTORATE?

Some paths to the doctoral degree are less traveled and some are more difficult to navigate, owing to a variety of influences that shape doctoral study. These paths may lead to different postgraduate destinations.

## Parental Education

### OVERVIEW

The parents of recent doctorate recipients are better educated than the parents of earlier cohorts of doctorate recipients. The share of doctorate recipients from families in which neither parent has earned more than a high school diploma declined to 18% in 2016. The share from families in which at least one parent has earned a bachelor's degree (26%) or at least one parent has an advanced degree (43%) continues to climb, rising from 57% of doctorate recipients in 1996 to 69% in 2016 (figure A).

### BY RACE AND ETHNICITY

The pattern of rising parental educational attainment is visible among all races and ethnicities for doctorate recipients who are U.S. citizens and permanent residents. Nonetheless, doctorate recipients from underrepresented minority groups are less likely to have at least one parent with a bachelor's degree than are Asian or white doctorate recipients.

In 2016, over half of American Indian or Alaska Native and Hispanic or Latino doctorate recipients and about half of black or African American recipients belonged to families in which at least one parent had a bachelor's degree or higher. In comparison, over 70% of Asian and white doctorate recipients came from families having at least one parent who had a bachelor's degree or higher (figure B).

## Sources of Financial Support

### OVERVIEW

Over the past 10 years, a declining share of doctoral students rely primarily on their own resources—loans, personal savings, personal earnings, and the earnings or savings of their spouse, partner, or family—to finance their graduate studies. In turn, increased proportions of students have relied on research assistantships (31%), fellowships or grants (28%), or teaching assistantships (21%) as their most important source of financial support during graduate school (figure C).

### BY FIELD OF STUDY

In 2016, fellowships or grants were the most common primary source of financial support for doctoral students in life sciences, with

41% of this group reporting such support. Research assistantships were the leading source of support in physical sciences and earth sciences (49%), mathematics and computer sciences (37%), and engineering (57%). Teaching assistantships were the most common source for doctoral students in humanities and arts (40%). In other non-science and engineering (non-S&E) fields and in psychology and social sciences, similar proportions of doctorate recipients reported fellowships or grants, teaching assistantships, and their own resources as their primary source of financial support. Doctoral students in education fields were the most likely to rely on their own resources, with 46% reporting this as their primary source of support (figure D).

## Education-Related Debt

The amount of education-related debt incurred by doctorate recipients during graduate school is an indicator of the availability of financial support. In 2016, more than two-thirds of doctorate recipients in life sciences and more than three-quarters of those in physical sciences and earth sciences, mathematics and computer sciences, and engineering reported holding no debt related to their graduate education when they were awarded the doctorate. In psychology and social sciences, humanities and arts, and other non-S&E fields, that proportion dropped to around one-half.

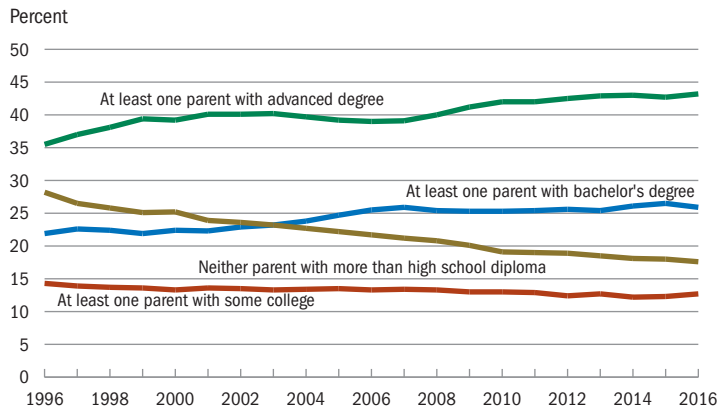
Within each broad field of study, 5% to 9% of doctorate recipients had incurred low levels (\$10,000 or less) of education-related debt by the time they graduated. The shares of doctoral graduates with education-related debt burdens over \$30,000 were greatest in education (36%), psychology and social sciences (31%), other non-S&E fields (30%), and humanities and arts (27%) (figure E).

## Time to Degree

The time between entering graduate school and earning the doctorate has fallen in all fields of study over the past 20 years, particularly in education. Since 1996, non-S&E fields have seen a greater reduction in the time to degree than have S&E fields. However, on average it still takes years longer to earn a doctorate in the non-S&E fields than it does to complete doctoral training in S&E fields (figure F).

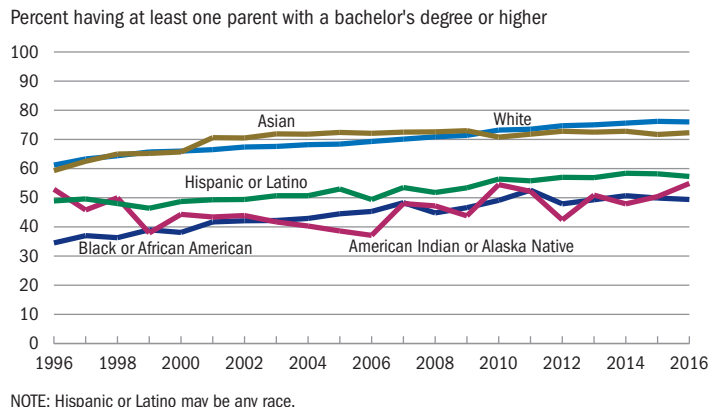
**A**

**Doctorates awarded, by highest parental educational attainment: 1996–2016**



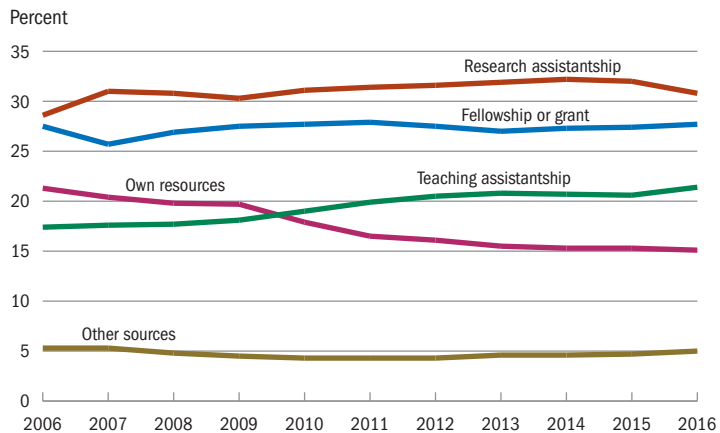
**B**

**Parental educational attainment of U.S. citizen or permanent resident doctorate recipients, by ethnicity and race: 1996–2016**



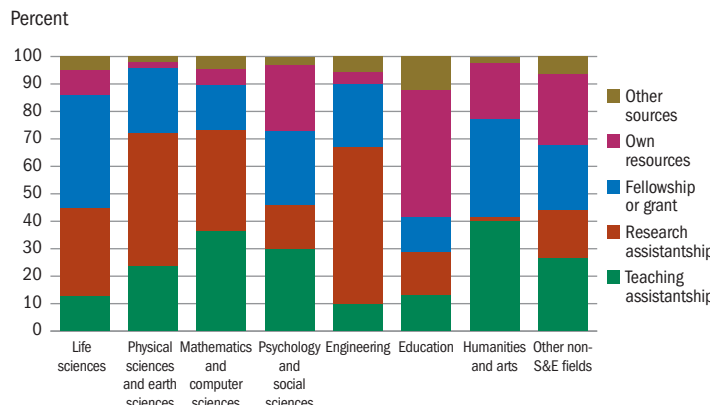
**C**

**Primary source of financial support for U.S. doctorate recipients: 2006–16**



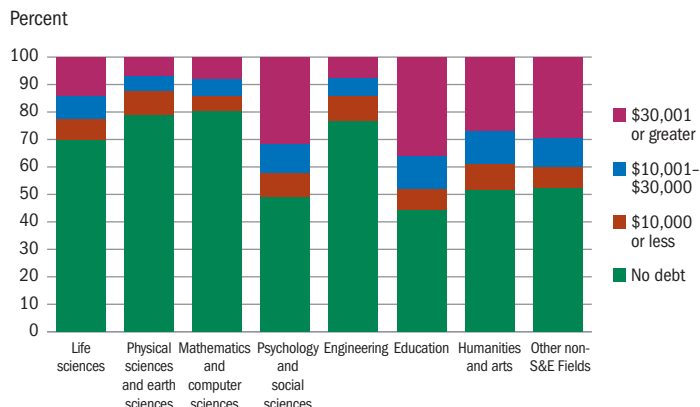
**D**

**Primary source of financial support for U.S. doctorate recipients, by broad field of study: 2016**



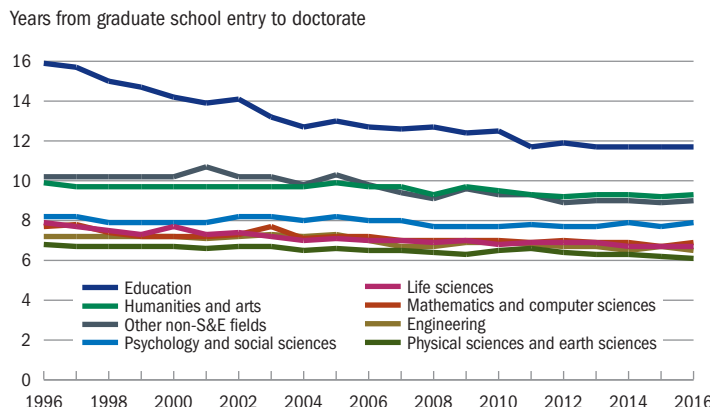
**E**

**Graduate education-related debt of U.S. doctorate recipients, by broad field of study: 2016**



**F**

**Median time to degree of U.S. doctorate recipients, by broad field of study: 1996–2016**



# WHAT ARE THE POSTGRADUATION TRENDS?

A graduate's first position after earning the doctoral degree may reflect broad economic conditions and can shape later career opportunities, earnings, and choices. Over the longer term, the early career patterns of doctorate recipients may influence the decisions of future generations of students considering careers as scientists, engineers, scholars, and researchers.

## Job Market

### SCIENCE AND ENGINEERING

At any given time, the job market for new doctorate recipients will be better in some fields of study than in others, although all fields tend to follow a similar cyclical pattern that generally reflects overall trends in economic conditions.

The proportion of doctorate recipients in science and engineering (S&E) fields who reported definite commitments for employment, including postdoctoral (postdoc) study, has been in decline since 2001. However, there has been a small uptick in the commitment shares for some fields since 2014 (figure A).

### NON-SCIENCE AND ENGINEERING

For doctorate recipients in non-S&E fields, the proportion of doctorate recipients with definite commitments for employment, including postdoc study, has been in decline since 2008. In 2016, the share of doctorate recipients with definite commitments remained at or near the 20-year low points in education, humanities and arts, and other non-S&E fields (figure B).

## First Postgraduate Position

### ACADEMIC EMPLOYMENT

In 2016, 45% of all doctorate recipients with definite employment commitments (excluding postdoc positions) in the United States reported that their principal job would be in academe.

The highest rates of academic employment commitments were reported by doctorate recipients in humanities and arts (76%) and in other non-S&E fields (76%); the lowest rates were reported in engineering (14%) and in physical sciences and earth sciences (20%). Since 2006, the rate of academic employment commitments by doctorate recipients in S&E fields has declined by 7 percentage points, whereas the academic employment rate of doctorates in non-S&E fields has risen due to the increase in academic commitments in education (figure C).

### POSTDOC POSITIONS

Historically, postdoc study positions have been a customary part of the early career paths of doctoral scientists in life sciences

and in physical sciences and earth sciences, and they have also become increasingly prevalent among recent doctoral graduates in mathematics and computer sciences, psychology and social sciences, and engineering. In 2010, the proportion of S&E doctorate recipients taking postdoc positions in the United States peaked and has since been in decline. Still, in 2016, 47% of all S&E doctorate recipients took postdoc positions immediately after graduation, including 63% of graduates in the life sciences (figure D).

## Median Salaries

In 2016, doctorate recipients who had definite commitments for a postdoc or other employed position in the United States in the coming year reported basic annual salaries that varied by their field of study and the type of position to which they committed.

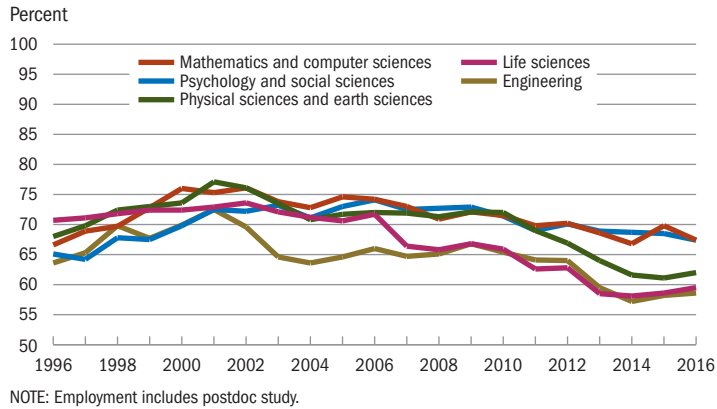
The median salaries for postdocs in all broad fields were relatively similar, ranging between \$43,000 and \$50,000, except for postdocs in mathematics and computer sciences who had a median salary of \$58,000. In every broad field, reported postdoc salaries were lower than salaries reported by doctorate recipients entering non-postdoc employment in industry or academe. Doctorate recipients in engineering and in the other non-S&E fields, such as business, reported the highest median academic salaries, whereas doctorate recipients in mathematics and computer sciences and in the other non-S&E fields reported the highest median salaries in industry positions (figure E).

## Visa Holders and Postgraduation

In 1996, 62% of temporary visa holder doctorate recipients with definite commitments for a postdoc or other employment reported that the location of their postgraduation position was in the United States. By 2016, that proportion had risen to greater than three-fourths. The share of temporary visa holder doctorate recipients whose definite commitments are in the United States is highest in fields where temporary visa holders are more heavily represented: life sciences, physical sciences and earth sciences, mathematics and computer sciences, and engineering (figure F).

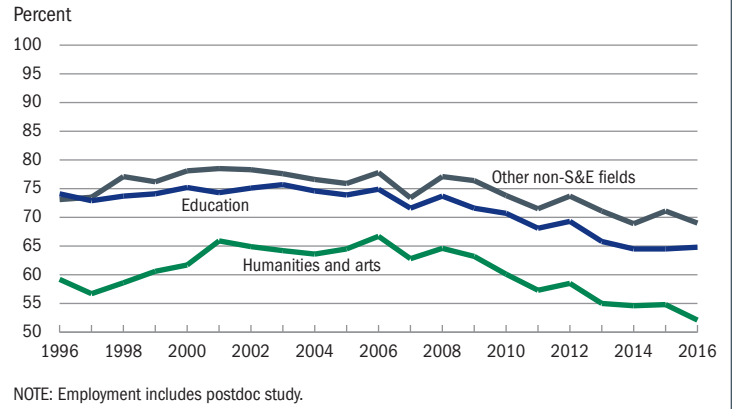
A

**Definite commitments for employment at doctorate award among U.S. doctorate recipients, by science and engineering field of study: 1996-2016**



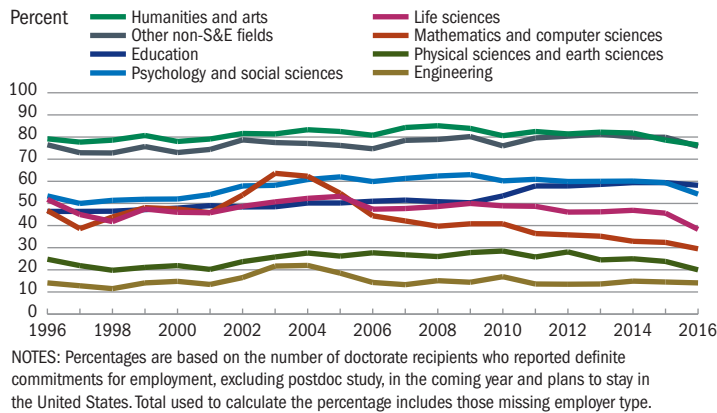
B

**Definite commitments for employment at doctorate award among U.S. doctorate recipients, by non-science and engineering field of study: 1996-2016**



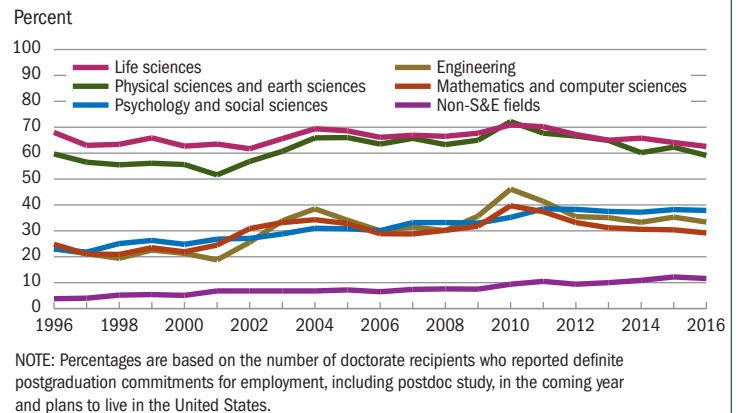
C

**Definite academic employment commitments in the United States, by broad field of study: 1996-2016**



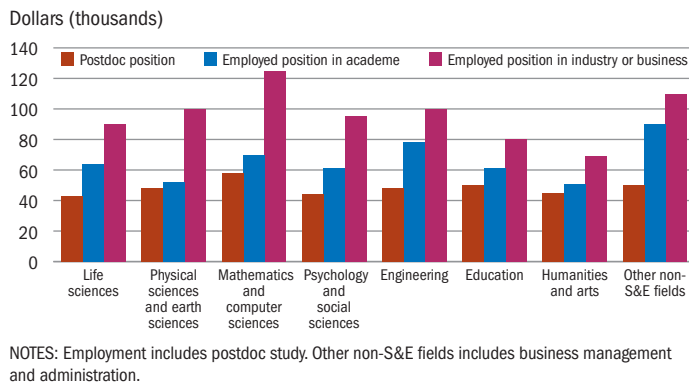
D

**U.S. postdoc rate for U.S. doctorate recipients, by broad field of study: 1996-2016**



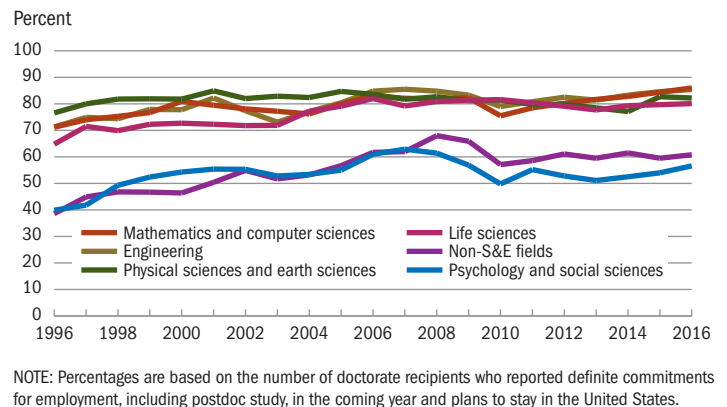
E

**Median basic annual salary of U.S. doctorate recipients with definite commitments for employment in the United States, by position type and broad field of study: 2016**



F

**Temporary visa holder U.S. doctorate recipients with definite commitments for employment in the United States, by broad field of study: 1996-2016**



# AGE AT DOCTORATE AWARD: WHAT ARE THE OVERALL TRENDS AND CHARACTERISTICS?

The doctoral experience may vary according to the age of the recipient at the time the doctorate was awarded. Different age groups differ on several characteristics, education choices, and outcomes.

## Overall Trends

The steep increase in the number of doctorate recipients from 1957 to 1972 was led by those age 30 or younger at the time of doctorate award, whose annual growth rate averaged 11%, whereas both the 31–40 age group and the 41 and older age group had average annual growth rates of 9%. From 1973 to 2001, the number of recipients age 41 or older at the time of graduation grew the fastest, at a 3% average annual growth rate, versus 1% for those age 31 to 40 years, and an average decline by 1% for those age 30 or younger. Since 2002, those age 30 or younger have again dominated the growth in the number of doctorate recipients, with an average annual growth rate of 4%, versus 2% for those age 31 to 40 and a decline of 2% for those age 41 or older (figure A).

## Characteristics of Doctorate Recipients

### SEX

Between 1957 and 2016, the median age at which women received their doctoral degree generally tracked that of men, although women's median age was higher. Median age peaked in 1992 at 33.3 years for men and 36.2 years for women. Since 1989, the gap between the two medians has been steadily closing. In 2016, women's median age (32.0 years) was only slightly higher than men's median age (31.3 years). This difference in median ages narrowed noticeably over time: from 4.7 years in 1957 to 3.2 years in 1989 and to 0.7 years in 2016 (figure B).

### RACE AND ETHNICITY

In 2016, among U.S. citizen and permanent resident doctorate recipients, those identifying as black or African American or as American Indian or Alaska Native were more likely to receive doctorates at age 41 or older, compared with other doctorate recipients in other racial or ethnic groups. They were also less likely to receive doctorates at age 30 or younger (figure C).

### CITIZENSHIP

From 1996 to 2016, the median age at the time of doctorate award declined for U.S. citizens by 2.9 years to 31.9 years and declined 1.4

years for temporary visa holders to 31.0 years. Doctorate recipients with temporary visas consistently received doctorates at a younger median age than did U.S. citizens and non-U.S. citizen permanent residents, although the difference between U.S. citizens and temporary visa holders narrowed to less than a year after 2008. Permanent residents exhibited year-to-year variability in median age at doctorate but stayed around 34 years over the 20-year period, whereas the other groups—U.S. citizens and temporary visa holders—exhibited a pronounced decline in median age at the time of degree award (figure D).

### DOCTORAL INSTITUTION

Age at the time the doctorate was awarded varied for students depending on the type of institution they attended. In 2016, highest research universities had the highest share of doctorate recipients age 30 or younger (48%) and the lowest share of recipients age 41 or older (9%). Moderate research universities exhibited the reverse pattern: they had the lowest share of doctorate recipients age 30 or younger (16%) and the highest share of recipients age 41 or older (48%). Institutions were classified according to the 2015 Carnegie Classification of Institutions of Higher Education (figure E).

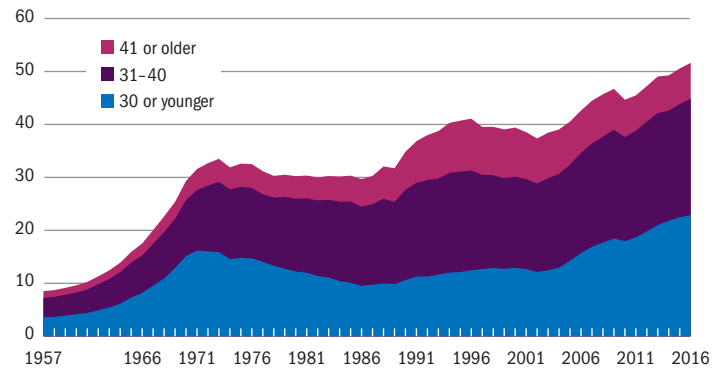
### FIELDS OF STUDY

Doctorate recipients in different fields of study had different age distributions at the time of degree completion. In 2016, at least one-half of the doctorate recipients in life sciences, physical sciences and earth sciences, mathematics and computer sciences, and engineering completed their degrees at age 30 or younger, whereas 10% or less finished their degrees at age 41 or older. Education doctorate recipients were more likely than recipients in other fields to be older: 40% earned doctorates at age 41 or older and only 12% received doctorates at age 30 or younger. The majority of doctorate recipients in humanities and arts (61%) and other non-science and engineering fields (52%) earned their degrees between the ages of 31 and 40 (figure F).

A

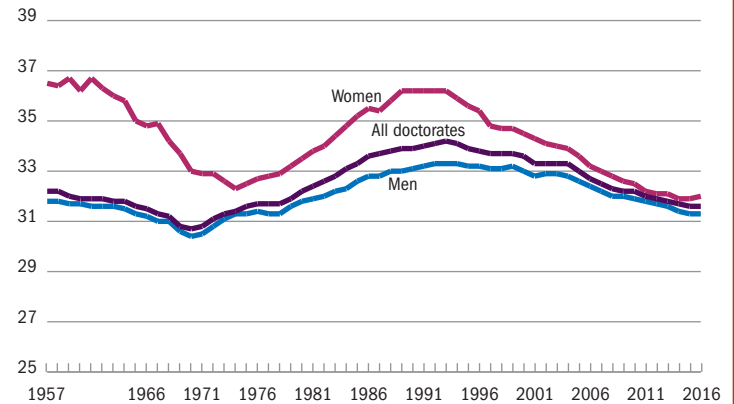
### Doctorates awarded by U.S. colleges and universities, by age at doctorate award: 1957-2016

Doctorate recipients (thousands)



### Median age at doctorate award, by sex: 1957-2016

Median age, years

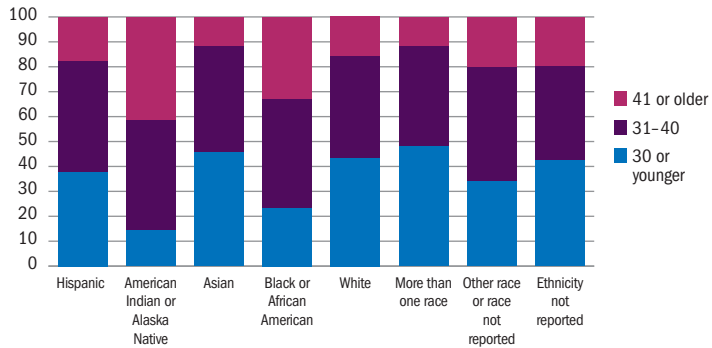


B

C

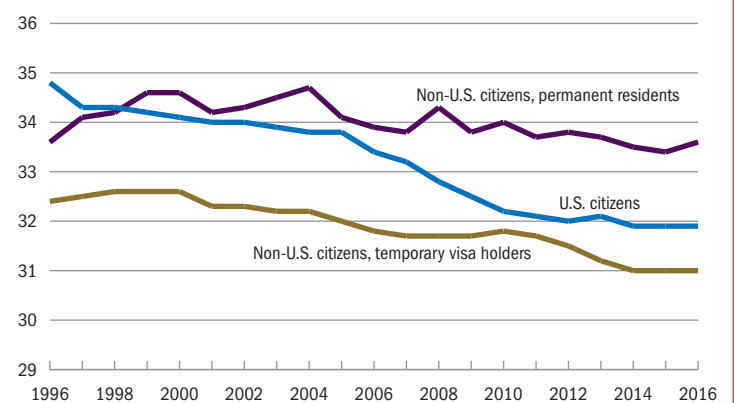
### Age at doctorate award among U.S. citizens and permanent residents, by ethnicity and race: 2016

Percent



### Median age at doctorate award, by citizenship: 1996-2016

Median age, years

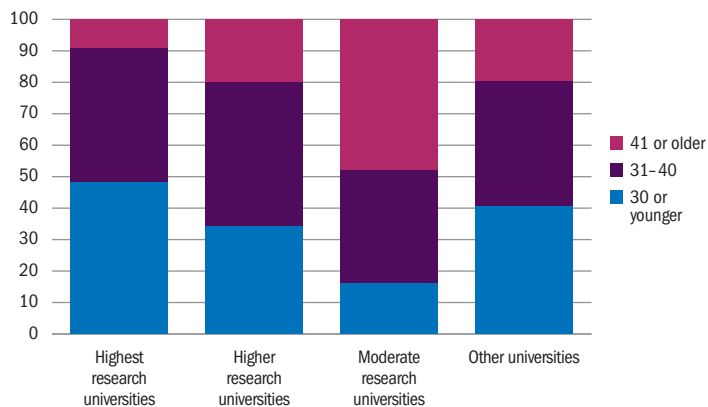


D

E

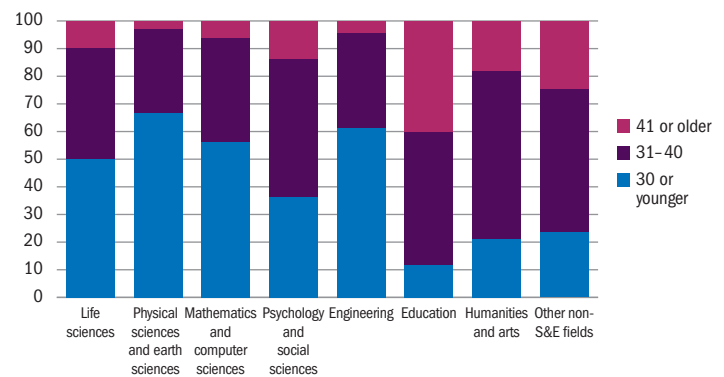
### Age at doctorate, by doctoral institution type: 2016

Percent



### Doctorates awarded by U.S. colleges and universities, by age at doctorate award and field of study: 2016

Percent



F

# AGE AT DOCTORATE AWARD: WHAT ARE THE EDUCATIONAL EXPENSES AND EMPLOYMENT OUTCOMES?

The primary source of financial support during graduate training, level of graduate education debt, and postgraduation plans all vary according to the age of a doctorate recipient at the time of graduation.

## Primary Source of Support

Primary source of financial support during graduate education differed substantially depending on the student's age at the time the doctorate was awarded. Among those age 30 or younger when they received a doctorate in 2016, 94% reported research assistantships, teaching assistantships, or fellowships or grants as their primary source of support. These sources of support were less common for those age 31 to 40 (79%) and for those age 41 or older at the time of graduation (36%). Almost one-half of those who received doctorates at age 41 or older reported their own resources as the primary source of support, compared to 16% for those age 31 to 40 and 4% for the youngest group (figure A).

## Education-Related Debt

The youngest doctorate recipients had considerably less graduate education debt than did other recipients. In 2016, over three-quarters (77%) of persons who received a doctorate award at age 30 or younger reported no graduate debt at all, compared to 55% of those age 31 to 40 and 50% of those age 41 or older. These differences among age groups were also strongly reflected in the highest graduate education debt category (\$30,001 or greater), where those age 41 or older at the time of graduation had more than triple the share of the youngest doctorate group (34% versus 9%) and where the those age 31 to 40 had more than double the share of the youngest group (24% versus 9%) (figure B).

## Definite Commitments to Postgraduation Study or Work

### OVERVIEW

The Survey of Earned Doctorates asks doctorate recipients about their postgraduation plans and whether respondents have definite commitments to a postdoc position or other employment. Between 1996 and 2016, all age groups saw an increase in the percentage with definite commitments during the late 1990s, followed by a gradual, though not steady, decline through the first decade of the 21st century and then a much steeper decline starting at the end of the decade. Starting in 2009, those age 30 or younger at the time of doctorate award were more likely to report a definite commitment

to a postdoc or other employment than were those in other age groups (figure C).

### POSTDOCS

The postdoc rate—the percentage of doctorate recipients with definite commitments in the United States for a postdoc position out of all doctorate recipients with postdoc or employment commitments—differed dramatically across doctorate age groups. Doctorate recipients age 41 or older at the time of doctorate award had a near constant postdoc rate from 2001 onward, averaging 10%. Postdoc rates were considerably higher for doctorate recipients age 31 to 40 at graduation (averaging 33%) and even more so for doctorate recipients age 30 or younger (averaging 49%). The two younger doctorate age groups exhibited the same trend over time, with increasing rates up to 2010–11 and declining rates after that period (figure D).

### EMPLOYMENT SECTOR

Among doctorate recipients with definite postgraduation commitments for non-postdoc employment, about half (52%) of the youngest age group took positions in the industry or business sector, double the rate of recipients age 31 to 40 at graduation (24%) and triple the rate of those age 41 or older (14%). About one-half of the two older doctorate groups took academic positions, whereas about one-third of the youngest group did so. Across all age groups, 10% or less of doctorate recipients with definite non-postdoc employment commitments reported government employment (figure E).

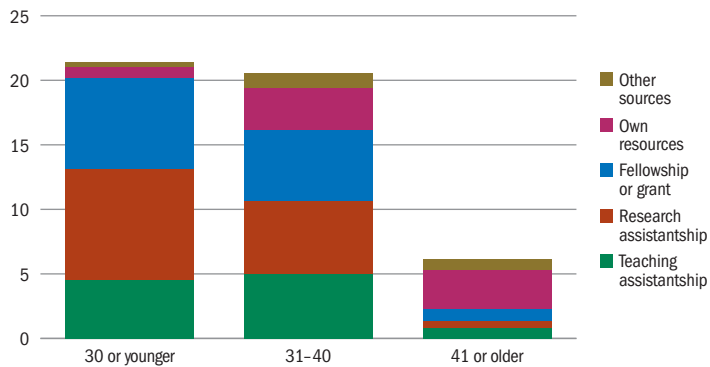
## Median Salary

Across different types of positions, median basic salaries in 2016 for doctorate recipients with definite postgraduation commitments for employment, including postdoc study, in the United States were nearly identical for doctorate recipients age 31 to 40 at graduation and for those age 30 or younger. The oldest doctorate group (age 41 or older) reported higher median salaries than the two younger groups for employment positions in industry or business (\$9,000 more) and government (about \$14,000 more). Median salaries were about the same across doctorate age groups for postdoc positions, and differences were modest for those taking academic positions (figure F).



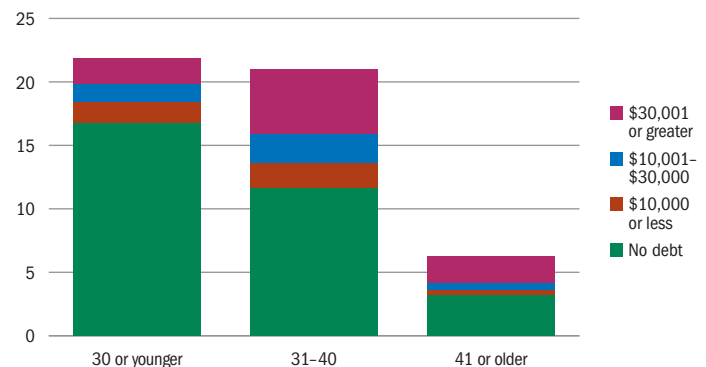
**A Primary source of financial support for U.S. doctorate recipients, by age at doctorate award: 2016**

Number of doctorates (thousands)



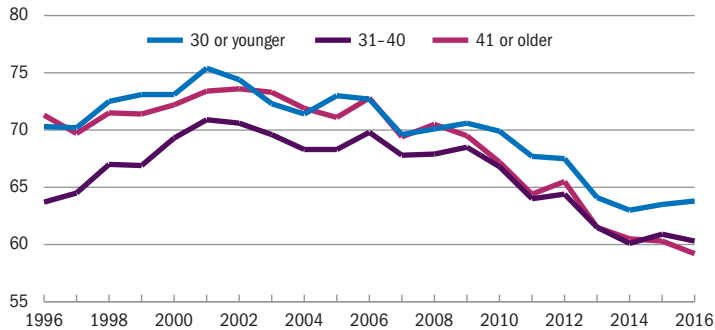
**B Graduate education-related debt of U.S. doctorate recipients, by age at doctorate award: 2016**

Number of doctorates (thousands)



**C Definite commitments for employment at doctorate award, by age at doctorate award: 1996-2016**

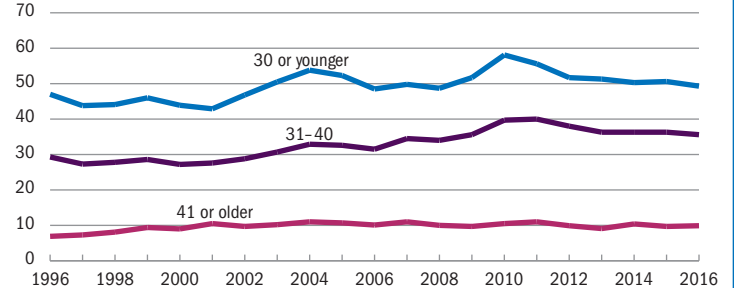
Percent



NOTE: Employment includes postdoc study.

**D U.S. postdoc rate for U.S. doctorate recipients, by age at doctorate award: 1996-2016**

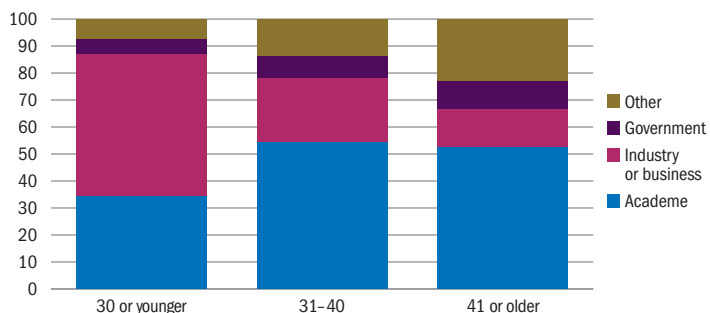
Percent



NOTE: Percentages are based on the number of doctorate recipients who reported definite postgraduation commitments for employment, including postdoc study, in the coming year and plans to live in the United States.

**E Employment sector of U.S. doctorate recipients with definite employment commitments, by age at doctorate award: 2016**

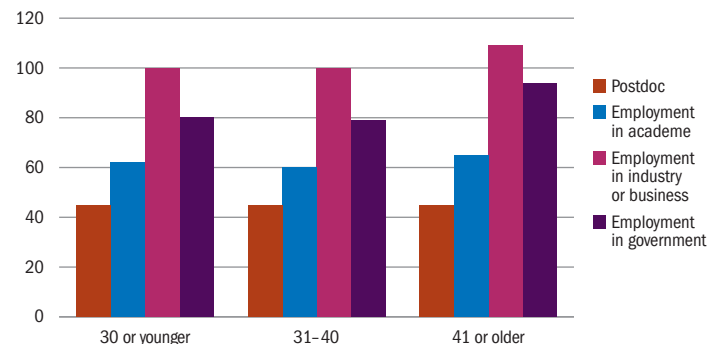
Percent



NOTE: Percentages are based on the number of doctorate recipients who reported definite commitments for employment, excluding postdoc study, in the coming year and plans to stay in the United States.

**F Median basic annual salary of U.S. doctorate recipients with definite commitments for employment in the United States, by position type and age at doctorate award: 2016**

Dollars (thousands)



## GLOSSARY

**Basic annual salary.** Annual salary to be earned from the doctorate recipient's principal job in the next year, not including bonuses or additional compensation for summertime teaching or research.

**Carnegie classification.** The Carnegie classification of academic institutions is a commonly used classification of postsecondary institutions based on level of degree awarded, fields in which degrees are conferred, and, in some cases, enrollment, federal research support, and selectivity of admissions criteria. The categories used here are from the 2015 version of the classification and include highest research universities, higher research universities, moderate research universities, and other universities.

**Definite commitment.** A commitment, through a contract or other method, by doctorate recipients to accept employment, including a postdoc study, in the coming year or to return to pre-doctoral employment.

**Definite employment commitment.** A definite commitment by doctorate recipients for employment in a non-postdoc position in the coming year.

**Field of study.** The Survey of Earned Doctorates (SED) collects data on 331 fields of doctoral study. For reporting purposes, these fields are grouped into 35 major fields and are further aggregated into eight broad fields: life sciences; physical sciences and earth sciences; mathematics and computer sciences; psychology and social sciences; engineering, education; humanities and arts; and other non-science and engineering fields. See technical table A-6 in the online resources of this report for a listing of the major fields within each broad field category. See the survey questionnaire for a full listing of the fine fields of study in 2016 (<https://www.nsf.gov/statistics/sed/>).

**Graduate education-related debt.** The amount of debt owed by a doctorate recipient at the time the doctorate is awarded that is directly related to graduate education.

**Non-S&E.** Non-science and engineering fields: A grouping of broad fields of study that includes education, humanities and arts, and other non-S&E fields, such as business.

**Parental educational attainment.** The highest level of education attained by either parent of a doctorate recipient.

**Postdoc position.** As defined on the questionnaire form, a temporary position primarily for gaining additional education and training in research, usually awarded in academe, industry, government, or a nonprofit organization.

**Postdoc rate.** The proportion of doctorate recipients who have definite commitments for a postdoc position among all doctorate recipients with definite commitments in the coming year, who reported whether their commitment was for postdoc study or other employment, and who plan to live in the United States.

**Race and ethnicity.** Doctorate recipients who report Hispanic or Latino heritage, regardless of racial designation, are counted as Hispanic or Latino, and as of 2013, those who do not answer the Hispanic or Latino ethnicity question are counted as "ethnicity not reported." Respondents who indicate that they are not Hispanic or Latino and indicate a single race are reported in their respective racial groups, except for those indicating Native Hawaiian or Other Pacific Islander, who are included in "other race or race not reported." Beginning in 2001, respondents who are not Hispanic or Latino and who indicate more than

one race are reported in the category “two or more races.” Data for this category were not collected before 2001. Before 2001, respondents who are not Hispanic or Latino and who indicate more than one race were categorized as “other or unknown.” For 2001 and later data, the “other or unknown” category includes doctorate recipients who indicated that they were not Hispanic or Latino and either did not respond to the race item or reported their race as Native Hawaiian and Other Pacific Islander. For 2000 and earlier data, Native Hawaiians and Other Pacific Islanders are counted in the Asian group.

**Research doctorate.** A doctoral degree that is oriented toward preparing students to make original intellectual contributions in a field of study and that is not primarily intended for the practice of a profession. Research doctorates require the completion of a dissertation or equivalent project. In this report, the terms “doctorate” and “doctoral degree” are used to represent any of the research doctoral degrees covered by the survey. Professional doctorates, such as the MD, DDS, JD, and PsyD, are not covered by the SED.

**S&E.** Science and engineering: A grouping of broad fields of study that includes science (life sciences, physical sciences and earth sciences, mathematics

and computer sciences, psychology and social sciences) and engineering fields.

**Sources of financial support.** Sources of financial support are grouped into the following five categories: fellowships (includes scholarships and grants), teaching assistantships, research assistantships (includes traineeships, internships, clinical residencies, and other assistantships), own resources (includes loans, personal savings, personal earnings, and earnings or savings of spouse, partner, or family), and other (includes employer reimbursements and support from non-U.S. sources).

**Time to degree.** The median time elapsed from the start of any graduate school program to completion of the doctoral degree. In addition to this measure, two other measures of time to degree are also reported in the data tables: median time elapsed from completion of the bachelor’s degree to completion of the doctorate, and median time elapsed from the start of the doctoral program.

**Underrepresented minority.** The following groups are underrepresented in science and engineering, relative to their numbers in the U.S. population: American Indian or Alaska Native, black or African American, and Hispanic or Latino.

## DATA SOURCE

The Survey of Earned Doctorates (SED) is the sole data source for *Doctorate Recipients from U.S. Universities: 2016*. The principal elements of the 2016 SED data collection are described in the sections that follow. More detailed information and related technical tables are available at [www.nsf.gov/statistics/sed/](http://www.nsf.gov/statistics/sed/).

**Survey eligibility.** The SED collects information on research doctorate recipients only. Research doctorates require the completion of a dissertation or equivalent project, are oriented toward preparing students to make original intellectual contributions in a field of study, and are not primarily intended for the practice of a profession. The 2016 SED recognized 18 distinct types of research doctorates. In 2016, 98% of research doctorate recipients earned the PhD.

**Survey universe.** The population eligible for the 2016 survey consisted of all individuals who received a research doctorate from an accredited U.S. academic institution in the 12-month period from 1 July 2015 to 30 June 2016. The total universe consisted of 54,904 persons in 436 institutions that conferred research doctorates in academic year 2016.

**Data collection.** Institutional coordinators at each doctorate awarding institution distributed the SED Web survey link (or paper survey form) to individuals receiving a research doctorate. Nonresponding graduates were contacted by e-mail, mail, or phone to request response to the questionnaire. NORC at the

University of Chicago conducted the 2016 SED data collection under contract to the National Center for Science and Engineering Statistics.

**Survey response rates.** In 2016, 92% of research doctorate recipients completed the survey instrument. Limited records (field of study, doctoral institution, and sex) are constructed for nonrespondents from administrative records of the university—commencement programs, graduation lists, and other public records—and are included in the reported total of doctorate recipients. Response rates for 2006–16 are provided in the technical tables.

**Time series data changes.** After a multiyear review of Doctor of Education (EdD) degree programs participating in the SED, 143 programs were reclassified from research doctorate to professional doctorate over the 2010–11 period. No additional reclassifications of EdD degree programs are planned. SED data are no longer being collected from graduates earning degrees from the reclassified EdD programs, and this has affected the reporting of the number of doctorates awarded by sex, citizenship, race, and ethnicity. Several figures in this report show a decline in number of degrees awarded from 2009 to 2011 (in particular, see figures D and F in the “Who earns a U.S. doctorate?” section and figure B in the “Which fields attract students?” section). Readers should note that the declines from 2009 to 2010 and from 2010 to 2011 are at least partly attributable to the EdD reclassification.

## FURTHER READING

For an overarching view of long-term trends in U.S. doctoral education, as reflected in the data from the Survey of Earned Doctorates (SED), please see *U.S. Doctorates in the 20th Century* (NSF 06-319, October 2006, <https://www.nsf.gov/statistics/nsf06319/>). Additional context is provided in summary reports for previous years (*Doctorate Recipients from U.S. Universities*), available at <https://www.nsf.gov/statistics/doctorates/>.

Other publications from the National Center for Science and Engineering Statistics use SED data to report on focused topics. Publications that relate to the topics covered in *Doctorate Recipients from U.S. Universities: 2016* are listed below, by relevant section.

### WHO EARNS A U.S. DOCTORATE? AND WHICH FIELDS ATTRACT STUDENTS?

*Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017* (NSF 17-310, January 2017, <https://www.nsf.gov/statistics/2017/nsf17310/>).

*Numbers of Doctorates Awarded in the United States Declined in 2010* (NSF 12-303, November 2011, <https://www.nsf.gov/statistics/infbrief/nsf12303/>).

*Numbers of Doctorates Awarded Continue to Grow in 2009; Indicators of Employment Outcomes Mixed* (NSF 11-305, November 2010, <https://www.nsf.gov/statistics/infbrief/nsf11305/>).

*Interdisciplinary Dissertation Research* (NSF 10-316, March 2010, <https://www.nsf.gov/statistics/infbrief/nsf10316/>).

*Numbers of U.S. Doctorates Awarded Rise for Sixth Year, but Growth Slower* (NSF 10-308, November 2009, <https://www.nsf.gov/statistics/infbrief/nsf10308/>).

### WHAT INFLUENCES THE PATH TO THE DOCTORATE?

*Baccalaureate Origins of U.S.-trained S&E Doctorate Recipients* (NSF 13-323, April 2013, <https://www.nsf.gov/statistics/infbrief/nsf13323/>).

*Role of HBCUs as Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients* (NSF 08-319, August 2008, <https://www.nsf.gov/statistics/infbrief/nsf08319/>).

*Baccalaureate Origins of S&E Doctorate Recipients* (NSF 08-311, July 2008, <https://www.nsf.gov/statistics/infbrief/nsf08311/>).

*Time to Degree of U.S. Research Doctorate Recipients* (NSF 06-312, March 2006, <https://www.nsf.gov/statistics/infbrief/nsf06312/>).

### WHAT ARE THE POSTGRADUATION TRENDS?

*Unemployment among Doctoral Scientists and Engineers Remained Below the National Average in 2013* (NSF 14-317, September 2014, <https://www.nsf.gov/statistics/infbrief/nsf14317/>).

*Unemployment among Doctoral Scientists and Engineers Increased but Remained below the National Average* (NSF 14-310, April 2014, <https://www.nsf.gov/statistics/infbrief/nsf14310/>).

*International Mobility and Employment Characteristics among Recent Recipients of U.S. Doctorates* (NSF 13-300, October 2012, <https://www.nsf.gov/statistics/infbrief/nsf13300/>).

*Emigration of U.S.-Born S&E Doctorate Recipients* (NSF 04-327, June 2004, <https://www.nsf.gov/statistics/infbrief/nsf04327/>).

*Plans for Postdoctoral Research Appointments among Recent U.S. Doctorate Recipients* (NSF 04-308, March 2004, <https://www.nsf.gov/statistics/infbrief/nsf04308/>).

*Interstate Migration Patterns of Recent Science and Engineering Doctorate Recipients* (NSF 02-311, February 2002, <https://www.nsf.gov/statistics/nsf02311/>).

## ONLINE RESOURCES

**A**n interactive version of the printed report and its related resources, described below, are available at <https://www.nsf.gov/statistics/sed/>.

**Data tables.** Data on the full range of survey items collected by the 2016 Survey of Earned Doctorates (SED) are presented in 72 detailed statistical tables. The full set of tables is available for download, either as PDF or Excel files.

**Figures.** The figures illustrating each theme are presented as interactive graphics and available for download as image files, accompanied by the supporting source data in Excel format.

**Survey questionnaire.** A link to the questionnaire for the 2016 SED appears in the “How Do I...” section of the online report.

**Technical notes and tables.** The technical notes provide more detail on how the SED collects data about recipients of research doctorates. The technical tables provide such information as the types of research doctoral degrees included in the SED, survey response rates over time, and details on field aggregations.

## ACKNOWLEDGMENTS

The conduct of the Survey of Earned Doctorates (SED), the maintenance of the SED, and resulting publications are supported by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) and by the National Institutes of Health (NIH), Department of Education (ED), National Endowment for the Humanities (NEH), Department of Agriculture (USDA), and National Aeronautics and Space Administration (NASA). These federal agencies gratefully acknowledge the support and assistance of graduate deans and their staff, registrars, dissertation officers, and other administrators who participate in the SED effort and contribute to its success. Appreciation is also extended to the new research doctorate recipients who completed the 2016 survey.

Mark Fiegenger and Karen Hamrick (NCSES) oversaw the preparation of this report. Emilda Rivers, John Gawalt, John Finamore, and Lynn Milan at NCSES reviewed and commented upon multiple drafts of the report and data tables. Staff at NORC at the University of Chicago who played a valuable role in the 2016 SED are Ipek Bilgen, Marietta Bowman, Matthew Deihl, Mireya Dominguez, Zachary Gebhardt, Brianna Groenhout, Isabel Guzman-Barron, Sarah Hernandez, Tom Hoffer, Cameron Koch, Mary Ann Latter, Stephen Schacht, Scott Sederstrom, Ed Sipulski, Kristy Webber, and Christopher Wong.

The report was edited and produced by Christine Hamel and Tanya Gore, with guidance from Catherine Corlies (NCSES). Drew Mitchell and staff at OmniStudio, Inc., designed the cover and layout. Development of the Web version was guided by Rajinder Raut (NCSES), with technical assistance from staff of Penobscot Bay Media.

### SUGGESTED CITATION

National Science Foundation, National Center for Science and Engineering Statistics. 2018. *Doctorate Recipients from U.S. Universities: 2016*. Special Report NSF 18-304. Alexandria, VA. Available at <https://www.nsf.gov/statistics/2018/nsf18304/>.

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NATIONAL SCIENCE FOUNDATION  
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NSF 18-304