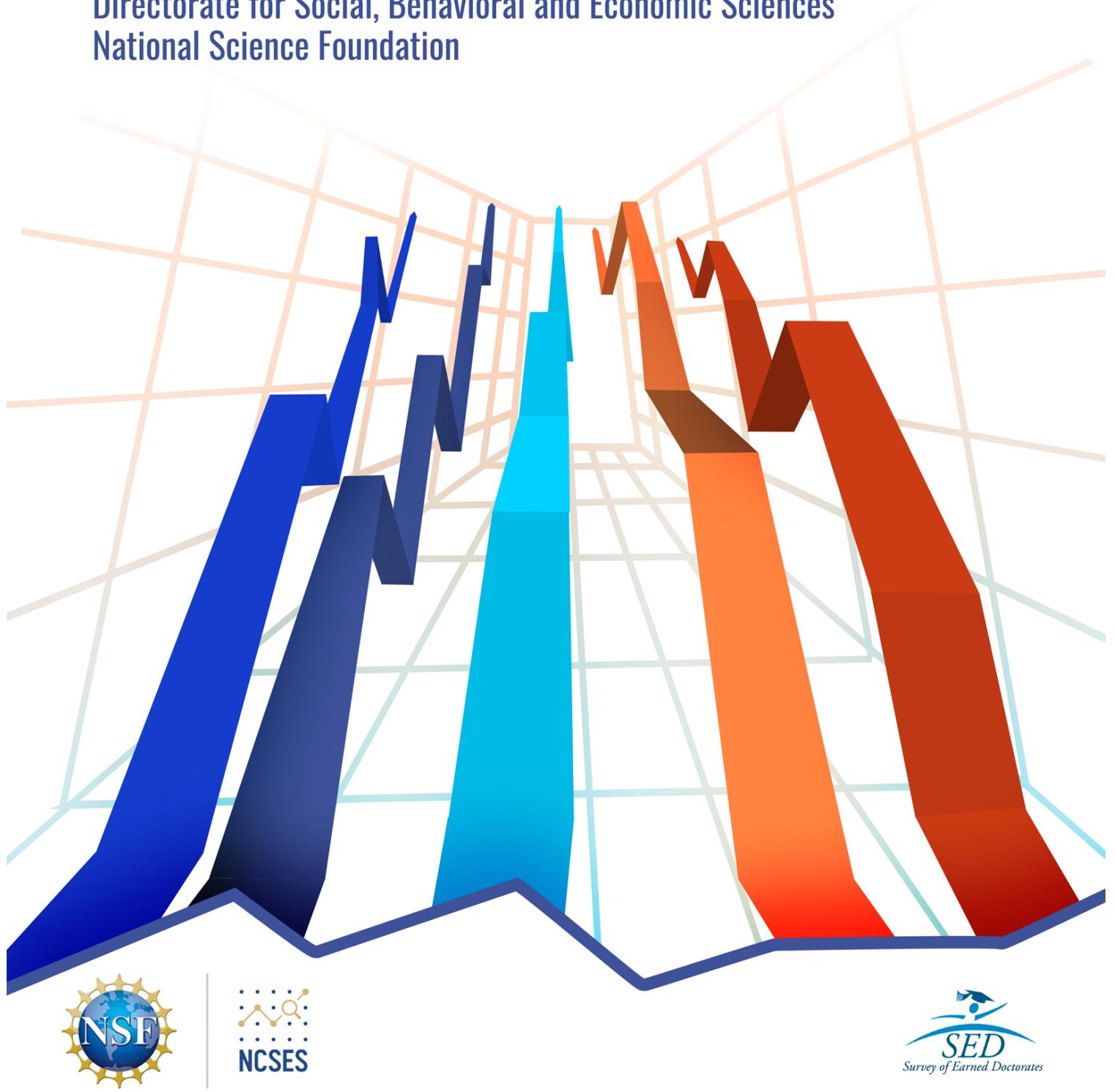


# 2022 Doctorate Recipients from U.S. Universities

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



## About this report

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The Survey of Earned Doctorates (SED), the data source for this report, is an annual census of individuals who earn research doctoral degrees from accredited U.S. academic institutions. The survey is sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation and by three other federal agencies: the National Institutes of Health, the Department of Education, and the National Endowment for the Humanities.

Monitoring the number of degrees awarded in science and engineering fields is an important part of the mission of NCSES, the nation's leading provider of statistical data on the U.S. science and engineering enterprise. The data from the SED are reported in several publications. The most comprehensive and widely cited publication is this summary report, *Doctorate Recipients from U.S. Universities*. This report calls attention to major trends in doctoral education and is organized into four recurring themes and a special focus area that highlight important questions about doctorate recipients. Online, the reader is invited to explore trends in greater depth through detailed data tables and interactive graphics (<https://ncses.nsf.gov/sed/>). Technical notes and related resources are provided to aid in interpreting the data, and report content is available for downloading. The SED data are also available via an interactive data tool (<https://ncsesdata.nsf.gov/builder/sed>) and the SED Restricted Data Analysis System (<https://ncsesdata.nsf.gov/rdas>).

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## Executive summary

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Doctoral education trains scientists, engineers, researchers, and scholars, all of whom are critical to the nation's progress. These individuals create and share new knowledge and new ways of thinking that lead, directly and indirectly, to new products, services, and works of art. 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 these counts can serve as leading indicators of the capacity for knowledge creation and innovation in various domains.

Changes in the characteristics of this population over time reflect political, economic, social, technological, and demographic trends. These include the following:

- Changes in representation of doctorate recipients in different demographic groups
- Growth in science and engineering (S&E) fields and changes in their relative size
- Different pathways to the doctoral degree
- Changes in completion time for doctoral study
- Expansion of the postdoctoral researcher pool
- Shifting academic employment opportunities after graduation

Understanding these connections is necessary to informing policy discussions regarding this country's doctoral education system.

In addition, this report highlights recent doctorate recipients' graduate experiences and postgraduation plans in the second year of the COVID-19 pandemic. The data in this report cover the 2022 academic year (1 July 2021 to 30 June 2022) and were collected primarily from doctorate students who completed the Survey of Earned Doctorates (SED) as they approached graduation. In 2021, NCSES added new survey questions specifically designed to measure the pandemic's impact on doctorate recipients. This report compares the results of these data to the previous year.

Key takeaways from the 2022 SED data include the following:

- The number of doctorate recipients from U.S. universities increased after two years of decline. The increase from 52,194 doctorate recipients in 2021 to 57,596 in 2022 was the sharpest 1-year increase (10%) since 1970.
- Between 2021 and 2022, the number of U.S. citizen and permanent resident doctorate recipients increased by 11% to 35,311, while temporary visa holders increased by 10% to 19,633.
- The increase in the number of doctorate recipients between 2021 and 2022 was proportionately larger in S&E fields (11%) than in non-S&E fields (7%).
- Over two-thirds of the 51,063 doctorate recipients who responded to questions about the impacts of the COVID-19 pandemic in 2022 indicated their research had been disrupted, compared to less than half of the 41,060 doctorate recipients who responded in 2021. For 80% of them, disruptions stemmed from limited or no access to resources needed for research.
- Over half of doctorate recipients who responded to the COVID-19 pandemic impact questions in 2022 indicated the timeline for completing the doctoral degree was delayed by the pandemic—the second most frequently reported impact. In contrast, 1 in 10 said funding for their doctoral studies had been reduced or suspended.

- The impact of the COVID-19 pandemic varied largely by field and nature of doctoral work, with research disruptions reported in larger proportions by doctorate recipients in fields where laboratories, equipment, and other facilities are indispensable, such as biological and biomedical sciences, physical sciences, and visual and performing arts.
- In 2022, the proportion of doctorate recipients with definite postgraduation commitments increased from 2021 in all fields. However, non-postdoctoral study (postdoc) academic employment commitments declined, while industry or business commitments increased. In addition, the postdoc rate in the United States declined or remained flat in most fields.
- Larger proportions of S&E doctorate recipients who were still seeking employment or negotiating job offers at graduation reported impacts from the COVID-19 pandemic, compared to their counterparts with firm postgraduation commitments.

## U.S. doctorate awards

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

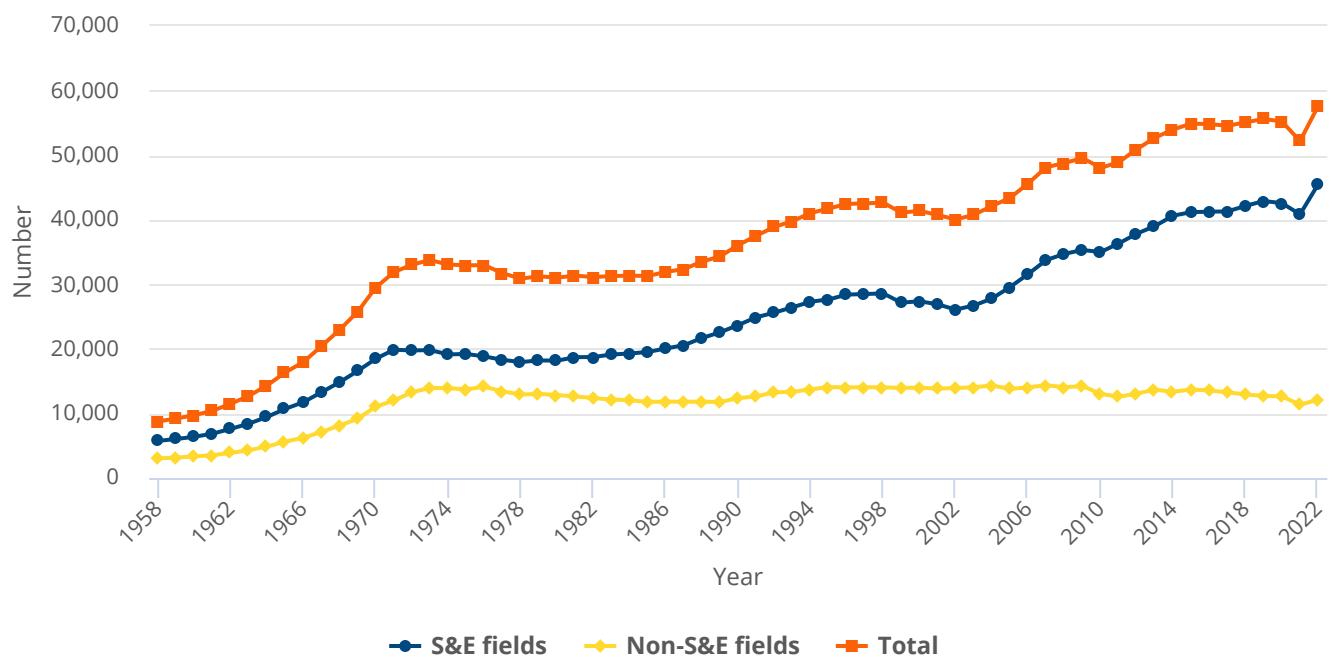
### Overall trends

The number of research doctoral degrees awarded by U.S. institutions increased from 52,194 in 2021 to 57,596 in 2022, according to the Survey of Earned Doctorates (SED) ([figure 1](#)). Since the survey's inception in 1957, there has been an upward trend in the number of doctorates awarded—with an average annual growth of 3.1% punctuated by periods of slow growth and some declines. However, the increase in 2022 was the steepest 1-year increase in the history of the SED (10.3%), surpassing the sharp decline seen in the previous year.

Since the SED began collecting data, the number of research doctorates awarded in science and engineering (S&E) fields has exceeded the number of non-S&E doctorates, and this gap has widened over time. From 2002 to 2022, the number of S&E doctorate recipients has increased by 74%, while the number of non-S&E doctorate recipients in 2022 was 13% lower than in 2002. As a result, the proportion of S&E doctorates to all doctorates climbed from 65% in 2002 to 79% in 2022.

**Figure 1**

Doctorates awarded by U.S. colleges and universities: 1958–2022



S&E = science and engineering.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-1.

## Citizenship

### Trends in citizenship

In 2022, the number of doctorates in S&E fields awarded to temporary visa holders was 17,091, an increase of 1,756 from 2021 ([figure 2](#)). Overall, S&E doctorates awarded to temporary visa holders increased 114% since 2002 and 34% since 2012. Over the past 20 years, the proportion of S&E doctorates awarded to temporary visa holders peaked at 41% in 2007, held steady at about 36% between 2011 and 2017, and gradually increased to 39% in 2022.<sup>1</sup>

Although starting from a larger base, the number of S&E doctorates awarded to U.S. citizens and permanent residents experienced a slower relative increase over the past 20 years (59% since 2002 and 16% since 2012) compared with S&E doctorates awarded to temporary visa holders. In 2022, the number of S&E U.S. citizen and permanent resident doctorate recipients was 26,408, an increase of 2,787 from 2021.

**Figure 2**

Doctorates awarded in S&E and non-S&E fields, by citizenship status: 2002–22



S&E = science and engineering.

**Note(s):**

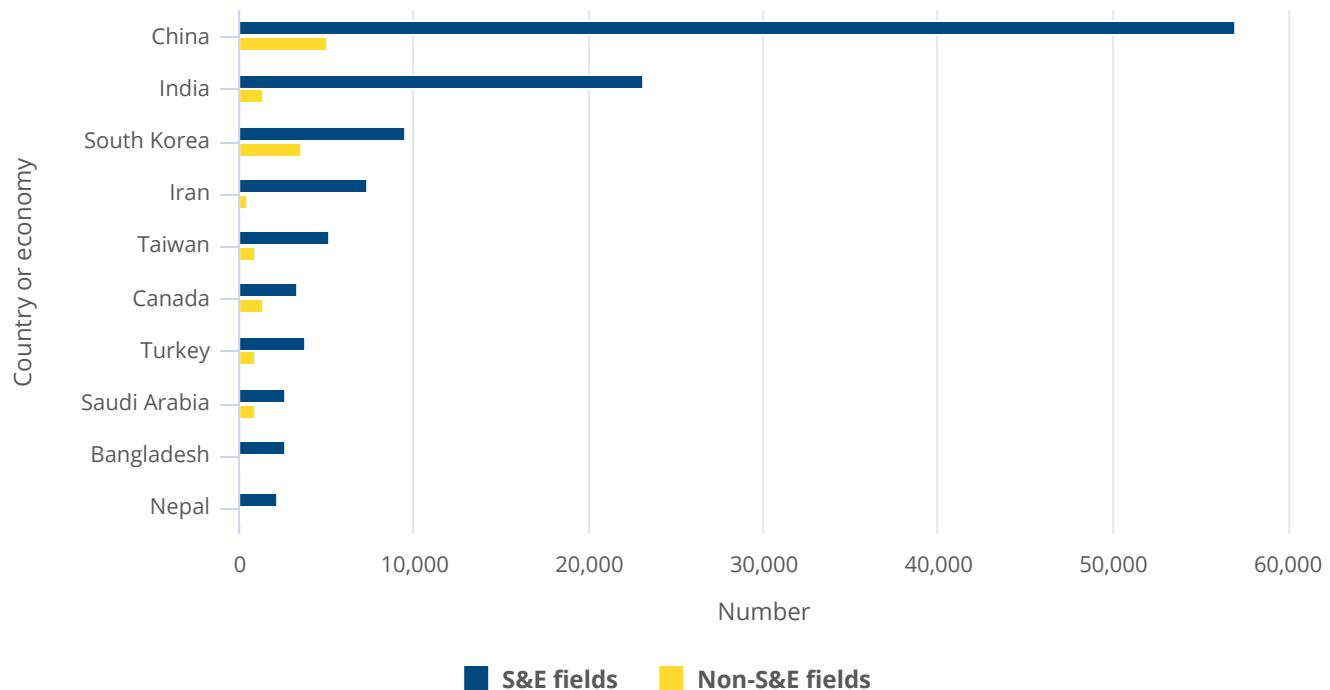
Excludes respondents who did not report citizenship. Counts of unreported citizenship fluctuated between 1,995 and 4,144.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-6 and table 1-7.

### Countries or economies of foreign citizenship

The number of doctorate recipients on temporary visas is highly concentrated in a few countries or economies of origin. Between 2012 and 2022, 10 countries or economies accounted for 70% of the 186,974 doctorates awarded to temporary visa holders during that time, and the top three countries—China, India, and South Korea—accounted for 53% ([figure 3](#)). Between 70% and 96% of doctorate recipients from each of the top 10 countries or economies earned a doctorate in an S&E field.

**Figure 3****Top 10 countries or economies of foreign citizenship for doctorate recipients with temporary visas: 2012–22**

S&amp;E = science and engineering.

**Note(s):**

China includes Hong Kong. Ranking based on total number of doctorate recipients.

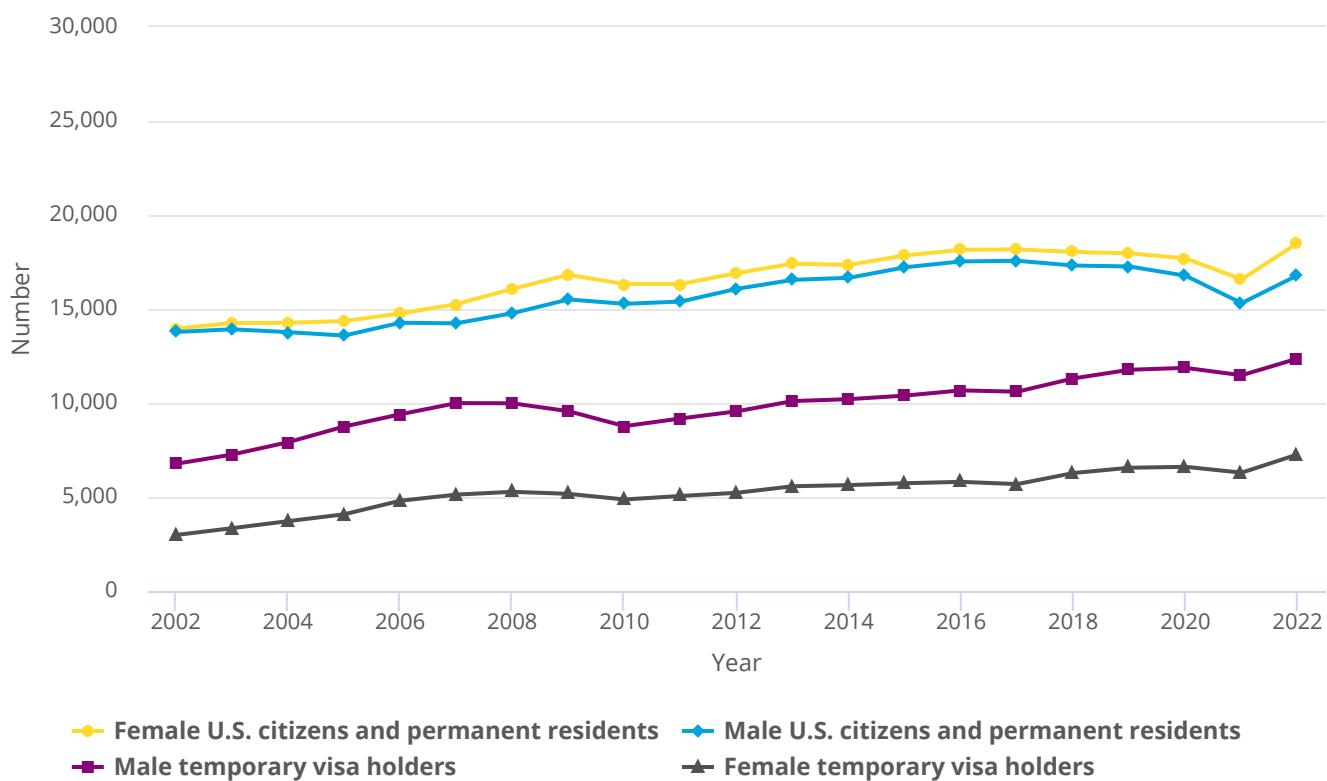
**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 7-7.

## Citizenship and sex

In 2022, women earned 47% of all doctorate awards ([figure 4](#)). Between 2002 and 2022, the rate of growth of female temporary visa holders was faster than the rate of growth of their U.S. citizen and permanent resident counterparts, although from a lower base. During this period, the proportion of women among U.S. citizens and permanent residents hovered around 51%–52%.<sup>2</sup> Meanwhile, the proportion of women among temporary visa holders increased gradually from 31% in 2002 to 35% in 2009, held steady until 2021, and increased to 37% in 2022.<sup>3</sup>

From 2021 to 2022, the increase in the number of female doctorate recipients was larger than the increase in male doctorate recipients, regardless of citizenship status. Among U.S. citizens and permanent residents, the number of women increased by 1,932 compared with 1,485 for men. Among temporary visa holders, the number of women increased by 972, compared with 890 for men.

**Figure 4****Doctorates awarded, by sex and citizenship: 2002–22****Note(s):**

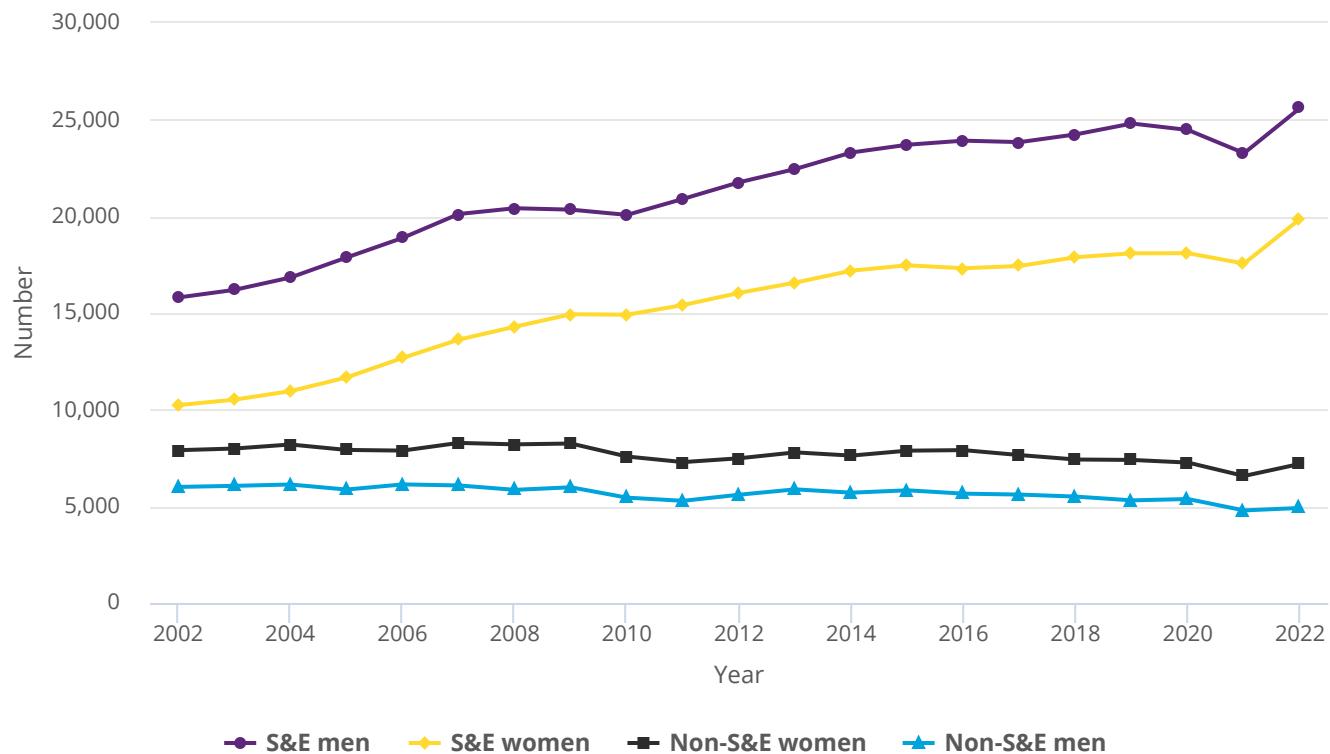
Excludes respondents who did not report sex or citizenship.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-9 and table 1-10.

**Sex**

In the past 20 years, most of the growth in the number of doctorates earned by both men and women has been in S&E fields ([figure 5](#)). During this period, the number of female doctorate recipients in S&E fields increased by 94%, compared with a 62% increase in the number of male S&E doctorate recipients. The proportion of female doctorate recipients in S&E increased from 39% in 2002 to 42% in 2009, remained fairly stable through 2019, and increased to 44% by 2022. In non-S&E fields, women earned 59% of doctorates in 2022, a proportion that has hovered around 57%–59% since the early 2000s. Between 2002 and 2022, the number of female doctorate recipients in non-S&E fields declined by 9%, while the number of male doctorate recipients in those fields declined by 18%. Between 2021 and 2022, the increase in the number of women (2,313) among S&E doctorate recipients was close to that of men (2,339). In contrast, the increase in the number of women in non-S&E fields (628) was nearly five times that of men (127).

**Figure 5****Doctorates awarded, by sex and field: 2002–22**

S&amp;E = science and engineering.

**Note(s):**

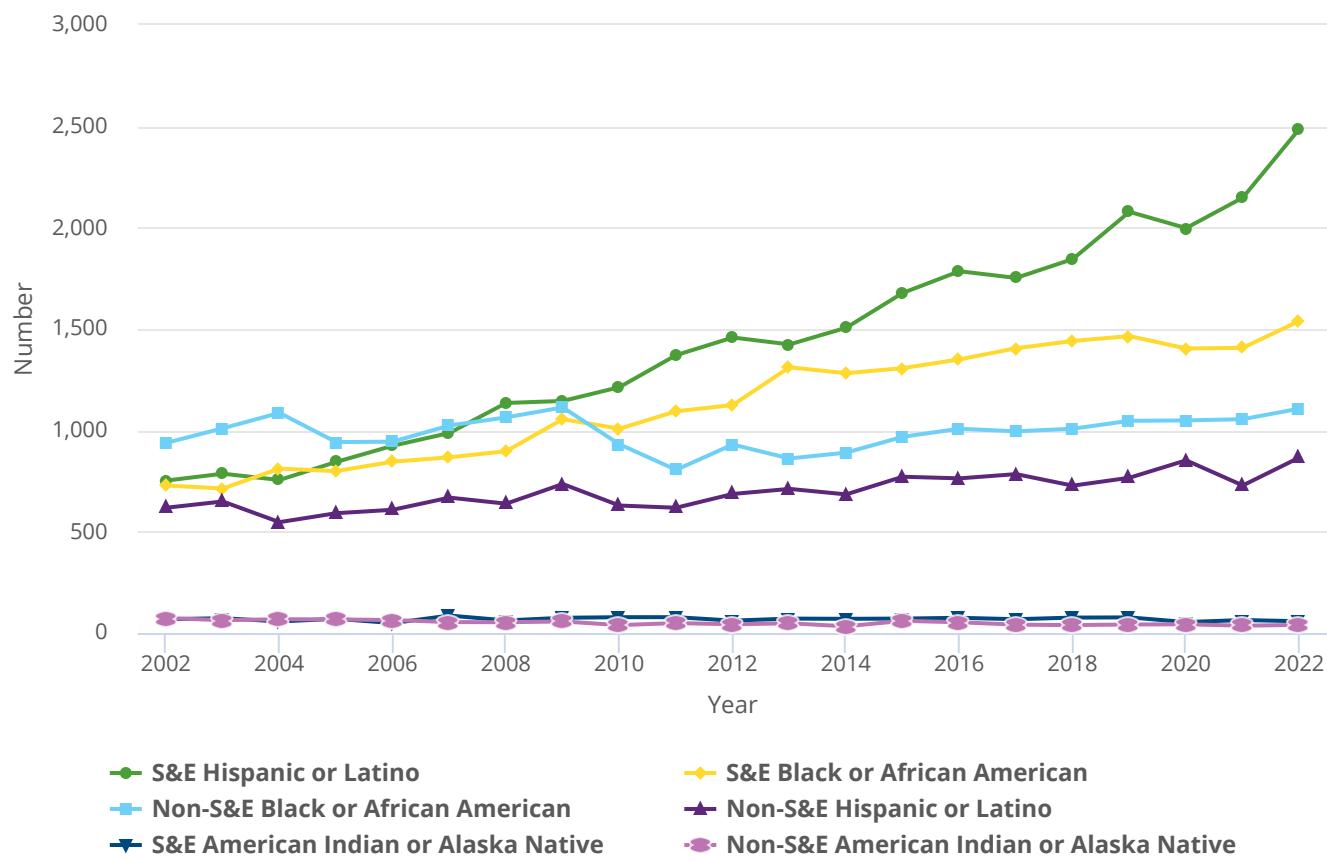
Excludes respondents who did not report sex.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-4 and table 1-5.

## Race and ethnicity

Racial and ethnic minority representation in doctorate awards has increased over time. From 2002 to 2022, the proportion of doctorates earned by White doctorate recipients among U.S. citizens and permanent residents declined from 76% to 66%, and the proportion earned by Asian U.S. citizens and permanent residents increased from 8% to 10%.<sup>4</sup> The proportion of Hispanic or Latino and Black or African American U.S. citizens and permanent residents also increased, although starting from a small base (figure 6). In the past 20 years, the number of Hispanic or Latino doctorate recipients in S&E increased from 752 (5%) to 2,488 (9%). The number of Black or African American doctorate recipients in S&E increased from 728 (4%) in 2002 to 1,540 (6%) in 2022.<sup>5</sup> In the same time period, the number of American Indian or Alaska Native doctorate recipients in S&E fluctuated between 49 and 86. Between 2021 and 2022, S&E doctorates awarded to American Indians or Alaska Natives declined from 64 to 58, remaining under 0.5% of S&E doctorates awarded to U.S. citizens and permanent residents. In the same time period, the number of Black or African American doctorate recipients in S&E increased by 133 to 1,540 and the number of Hispanic or Latino doctorate recipients in S&E increased by 340 to 2,488—the highest numbers of doctorates awarded to each of these groups in the past 20 years.

**Figure 6****Doctorates earned by U.S. citizen and permanent resident minority groups underrepresented in S&E, by field: 2002–22**

S&E = science and engineering.

**Note(s):**

Excludes U.S. citizen and permanent resident respondents who did not report race or ethnicity. Counts of unreported race or ethnicity fluctuated between 434 and 982. Beginning in 2021, a modified version of the 2020 Classification of Instructional Programs (CIP) codes was used in the survey data collection; the historical fields were constructed using the Survey of Earned Doctorates (SED)-CIP code crosswalk in table A-6. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “Data source” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-8 and table 1-11.

## Field of doctorate

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

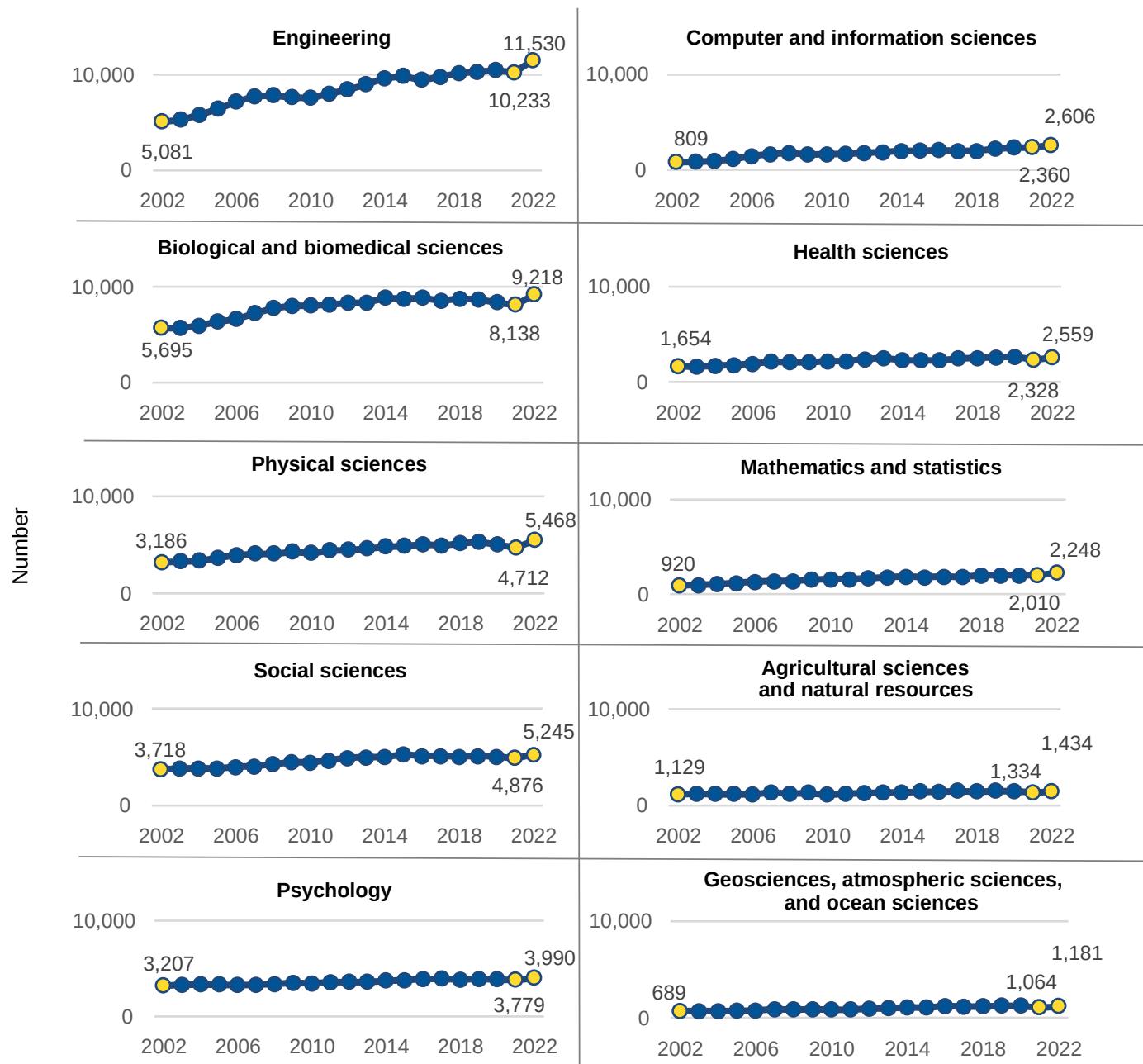
### Field of doctorate trends

#### S&E

Doctorates in S&E fields are a growing share of all doctorates awarded. Over the past 2 decades, doctorates in every broad S&E field increased in number. However, the fields of psychology, social sciences, and agricultural sciences and natural resources declined slightly in proportion to all doctorates awarded, despite their increase in number. Among S&E fields, engineering grew the most, from 13% of all doctorates in 2002 to 20% in 2022 ([figure 1](#) and [figure 7](#)). Between 2021 and 2022, all S&E broad fields grew in the number of doctorate recipients. The S&E fields with the largest increases in doctorate recipients in 2022 were engineering (1,297 or 13% increase from 2021), biological and biomedical sciences (1,080 or 13% increase from 2021), and physical sciences (756 or 16% from 2021).<sup>6</sup>

#### Non-S&E

Among non-S&E broad fields in the past 20 years, the number of doctorates awarded in humanities and arts declined while the number in business increased ([figure 8](#)). From 2012 to 2022, the number of doctorates declined by 293 in education and 1,097 in humanities and arts.<sup>7</sup> Between 2021 and 2022, the number of doctorates increased in these three fields (humanities and arts by 330, education by 257, and business by 61). However, the increases were not large enough to bring the number of doctorate recipients in these three fields to pre-pandemic levels.

**Figure 7****Doctorates awarded in S&E trend broad fields: 2002–22**

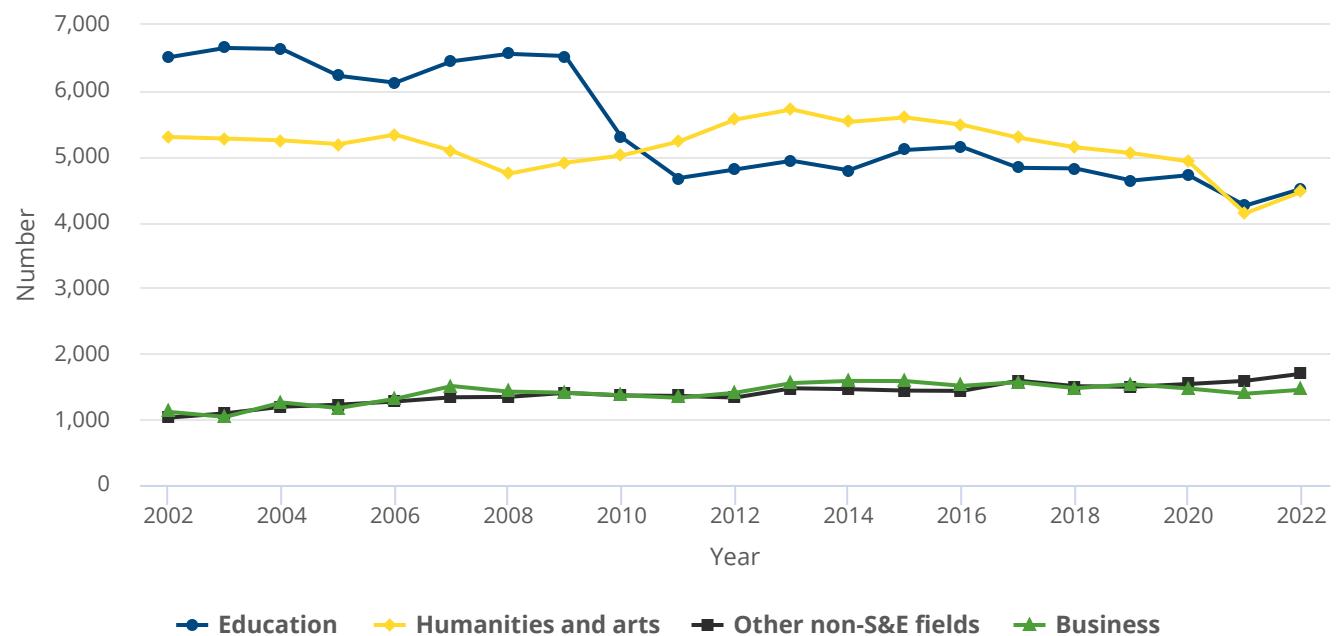
S&E = science and engineering.

**Note(s):**

The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-3.

**Figure 8****Doctorates awarded in non-S&E trend broad fields: 2002–22**

S&E = science and engineering.

**Note(s):**

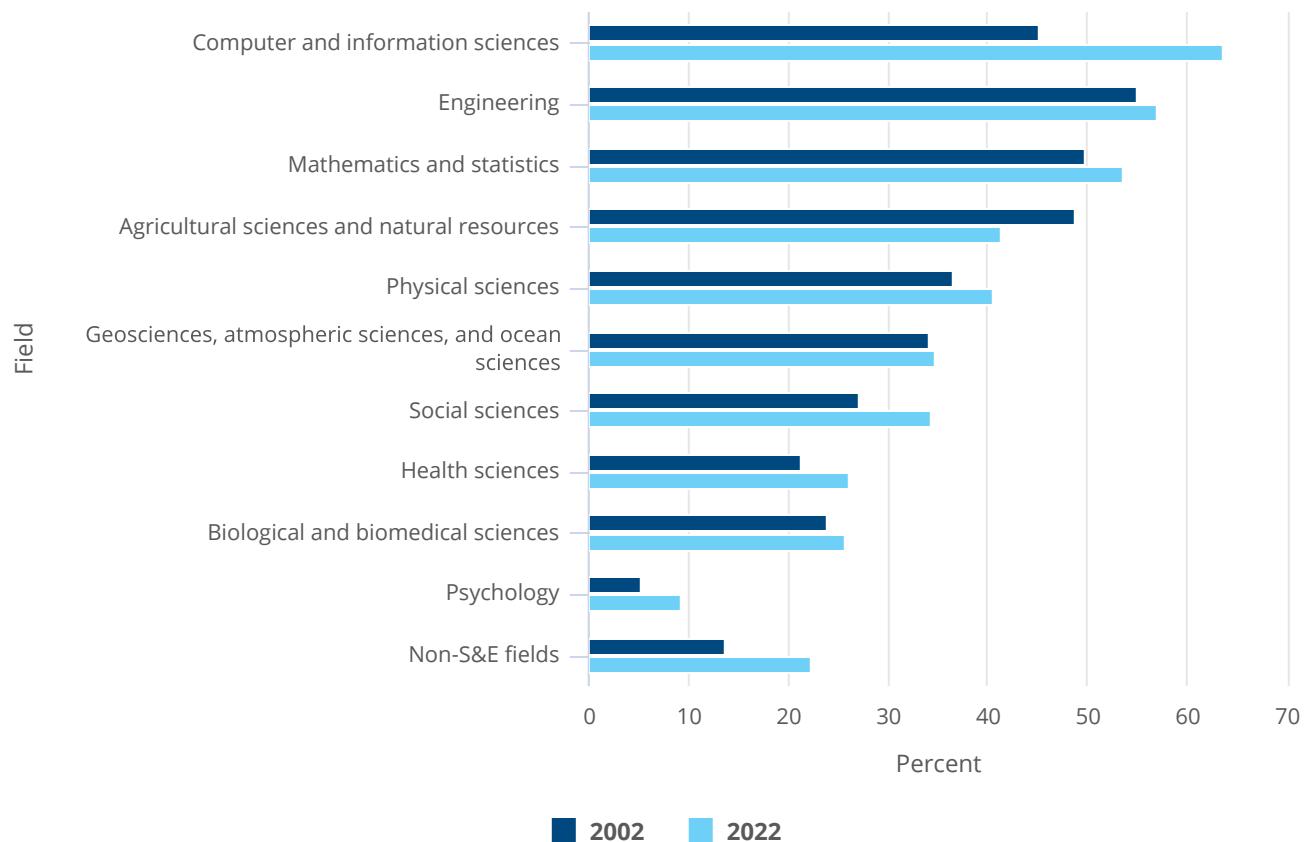
The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information on this and details on the drop in education doctorates between 2009 and 2011, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-3.

## Temporary visa holders

In the past 2 decades, the number of U.S. citizen and permanent resident doctorate recipients increased in every broad field of study except education<sup>8</sup> and humanities and arts, while doctorates awarded to temporary visa holders increased in every broad field.<sup>9</sup> In 2022, temporary visa holders earned the majority of doctorates in computer and information sciences (64%), engineering (57%), and mathematics and statistics (54%) ([figure 9](#)). The largest increases in the proportions of temporary visa holders since 2002 were in computer and information sciences, social sciences, and non-S&E broad fields. During this period, the proportion of temporary visa holder doctorate recipients declined in only one broad field—agricultural sciences and natural resources.

**Figure 9****Doctorate recipients on temporary visas, by trend broad fields: 2002 and 2022**

S&E = science and engineering.

**Note(s):**

Percentages are based on the number of doctorate recipients who reported citizenship. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the ["Data source"](#) section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-6.

## U.S. citizens and permanent residents

While racial and ethnic minorities' representation in doctoral degrees has increased over time, White recipients still hold the majority of doctoral degrees among U.S. citizens and permanent residents. In 2022, 66% of the 26,408 U.S. citizen and permanent resident doctorate recipients in S&E fields identified as White; 11% identified as Asian, 9% Hispanic or Latino, 6% Black or African American, and 4% as more than one race ([table A](#)). The remaining 3% identified as American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or did not report their race or ethnicity.

**Table A****S&E doctorates awarded to U.S. citizens and permanent residents, by race or ethnicity: 2022**

(Number and percent)

Race and ethnicity	Number	Percent
U.S. citizens and permanent residents	26,408	100
Hispanic or Latino	2,488	9.4
Not Hispanic or Latino	23,432	88.7
American Indian or Alaska Native	58	0.2
Asian	3,008	11.4
Black or African American	1,540	5.8
White	17,551	66.5
More than one race	953	3.6
Other race or race not reported	322	1.2
Ethnicity not reported	488	1.8

S&amp;E = science and engineering.

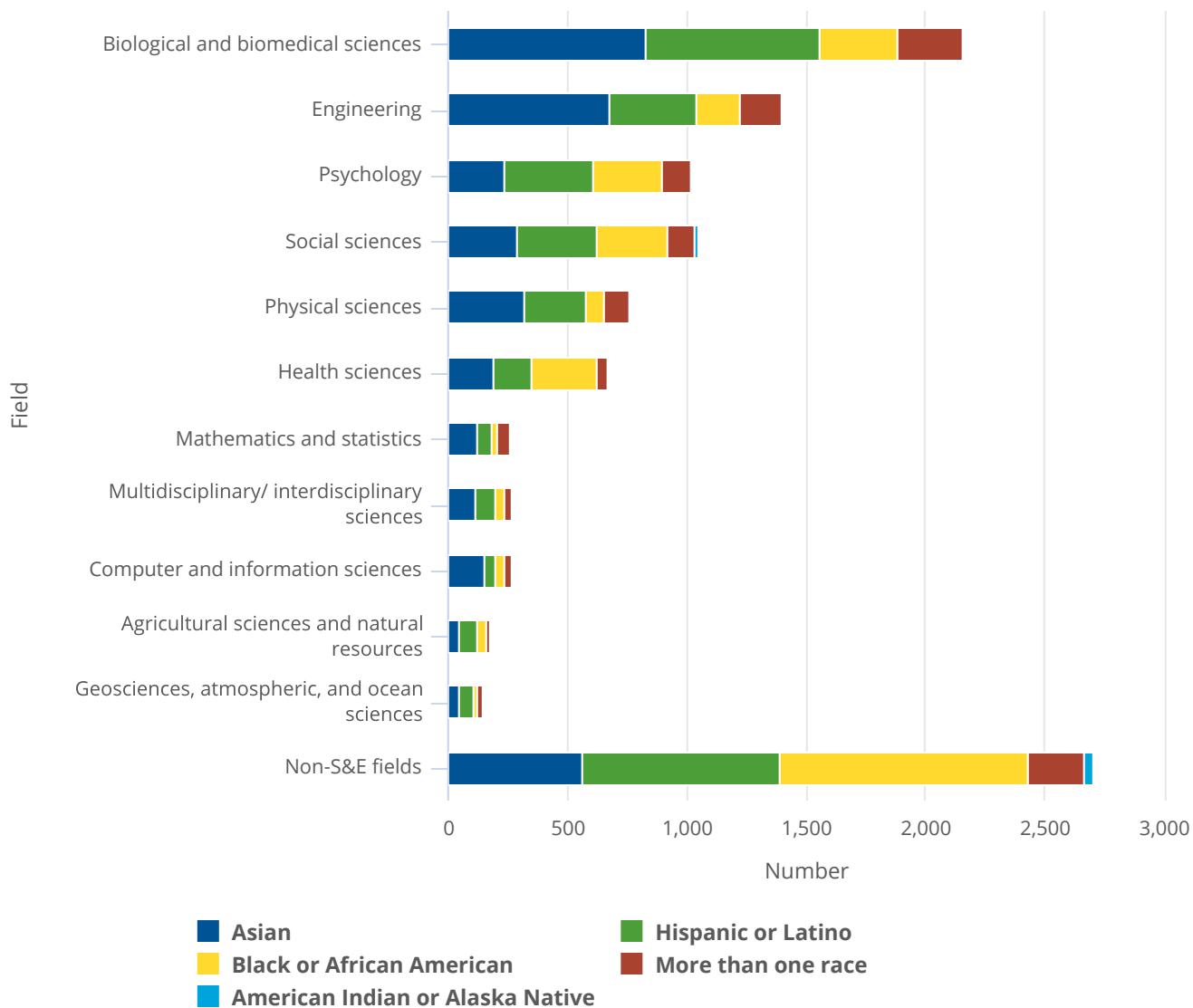
**Note(s):**

Percentages may not sum to 100 due to rounding.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-11.

White doctorate recipients accounted for the majority of doctorate recipients in each field, ranging from 64% in computer and information sciences to 80% in geosciences, atmospheric, and ocean sciences.<sup>10</sup> In 2022, Asian doctorate recipients earned a larger share of doctoral degrees than other minority racial and ethnic groups in computer and information sciences, engineering, mathematics and statistics, physical sciences, and biological and biomedical sciences ([figure 10](#)). Black or African American doctorate recipients were the largest racial or ethnic minority group in health sciences and non-S&E fields (particularly in education).<sup>11</sup> Hispanic or Latino doctorate recipients were the largest minority group in geosciences, atmospheric, and ocean sciences and in agricultural sciences and natural resources.

**Figure 10****Doctorates awarded to U.S. citizens and permanent residents, by selected race or ethnicity and broad field: 2022**

S&E = science and engineering.

**Note(s):**

Excludes U.S. citizen and permanent resident respondents who did not report race or ethnicity or were Native Hawaiian or Other Pacific Islander. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the "Data source" section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 3-4.

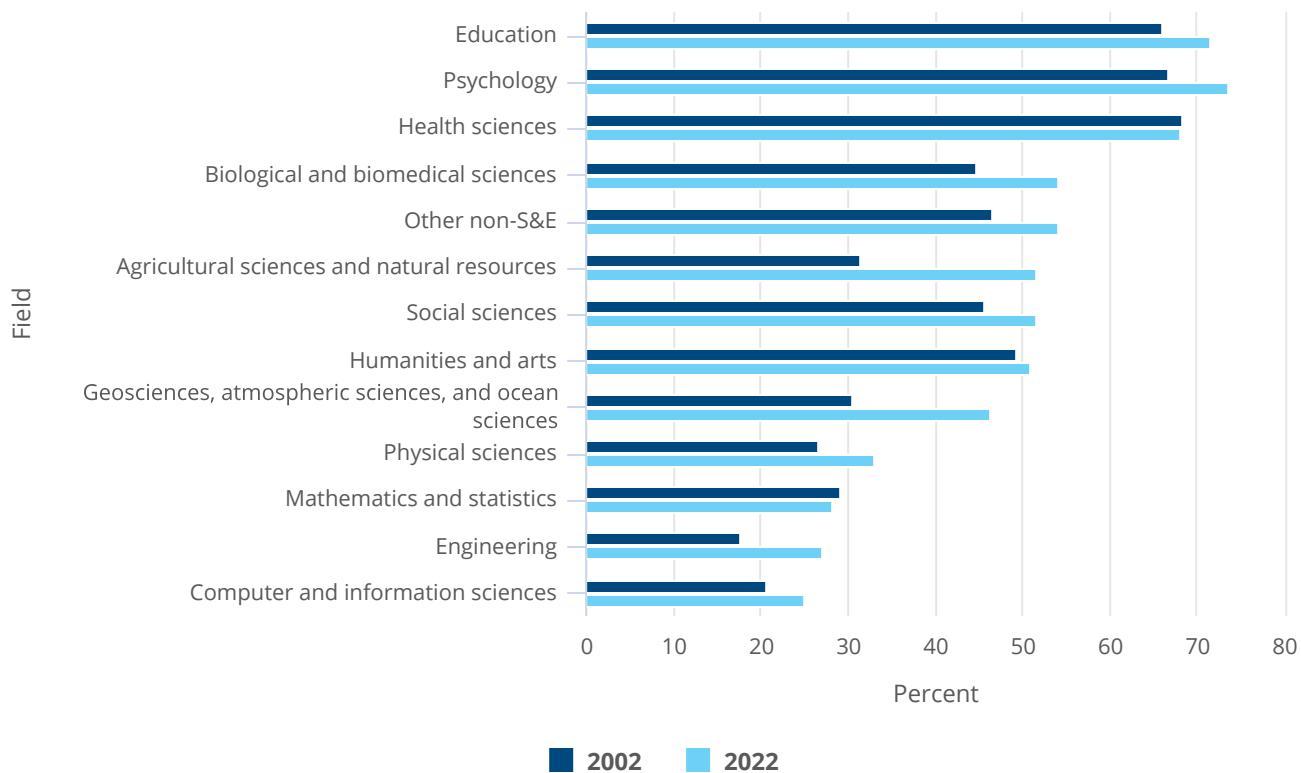
## Women

### Overview

Women's share of doctorates has grown over the past 2 decades in most S&E broad fields ([figure 11](#)). In 2022, women earned more than half of the doctorates in psychology, health sciences, biological and biomedical sciences, social sciences, agricultural sciences and natural resources, education, humanities and arts, and other non-S&E fields.<sup>12</sup> Women earned between about 25% and 46% of the doctorates awarded in computer and information sciences; engineering; mathematics and statistics; physical sciences; and geosciences, atmospheric, and ocean sciences in 2022. However, women's shares of doctorates in most of these broad fields have grown over the past 20 years. From 2002 to 2022, the proportion of female doctorates grew between 9 and 20 percentage points in agricultural sciences and natural resources; geosciences, atmospheric sciences, and ocean sciences; biological and biomedical sciences; and engineering. In computer and information sciences, social sciences, physical sciences, and psychology, women's share in each field grew between 4 and 7 percentage points during this period.

**Figure 11**

Doctorates awarded to women, by trend broad field: 2002 and 2022



S&E = science and engineering.

**Note(s):**

The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the "[Data source](#)" section.

**Source(s):**

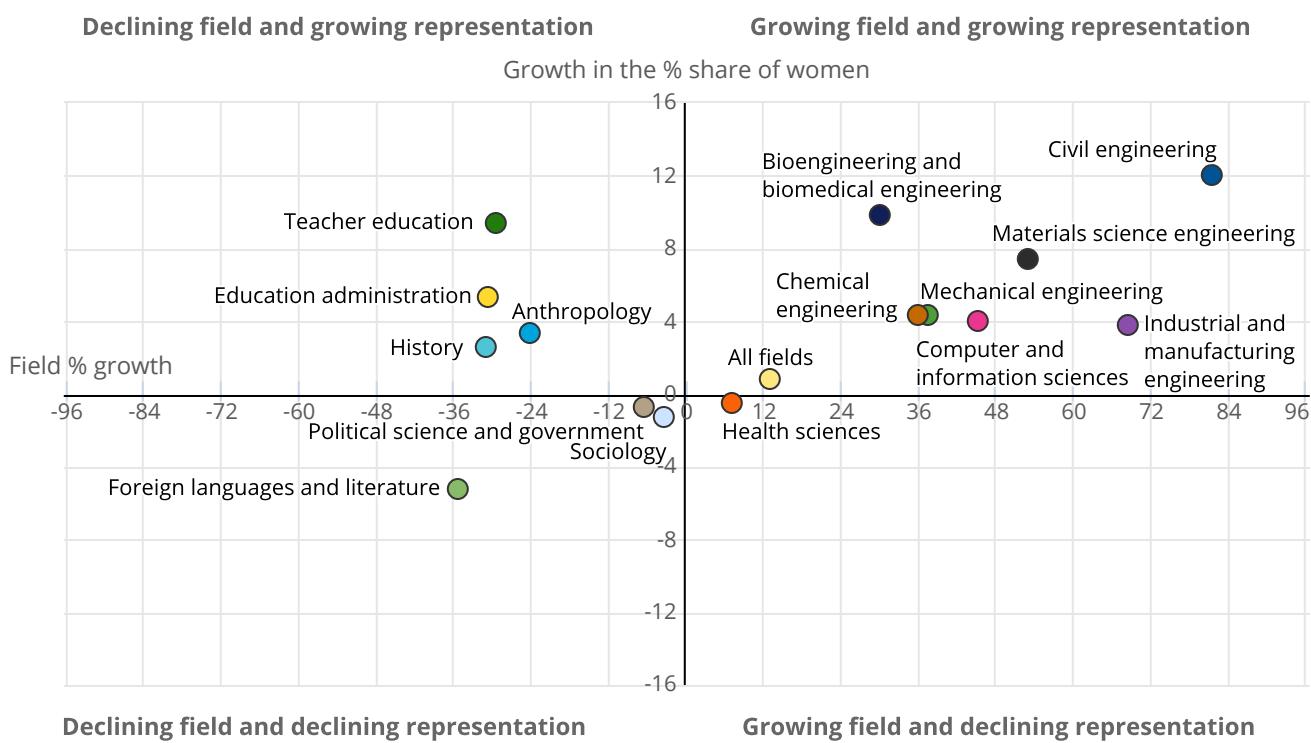
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-4 and table 1-5.

## Growing and declining S&E fields

The growth or decline in the share of female doctorate recipients in different fields does not always track with the overall growth in those fields. Between 2012 and 2022, the number of doctorate recipients in all fields increased by 13% while the share of women increased by 0.8 percentage points (figure 12).<sup>13</sup> From 2012 to 2022, the proportion of female doctorate recipients increased between 4 and 12 percentage points in the seven top growing fields (fields that grew 30% or more during these 10 years): civil engineering, bioengineering and biomedical engineering, material sciences engineering, mechanical engineering, chemical engineering, computer and information sciences, and industrial and manufacturing engineering. Women's share of doctorates also increased between 3 and 9 percentage points in teacher education, education administration, anthropology, and history—fields in which the overall number of doctorates awarded declined between 25% and 30% during this 10-year period. Despite the growth of doctorate recipients in health sciences by 7% in the past 10 years, women's shares of doctorates declined by about 1 percentage point. The proportion of female doctorate recipients also declined in foreign languages and literature, political science and government, and sociology—fields in which the overall number of doctorates declined as well.

**Figure 12**

**Fastest-changing fields for female doctorate recipients and the overall growth rates of these fields: 2012–22**



**Note(s):**

Fastest-changing fields for female doctorate recipients are the fields with the highest or lowest percentage-point changes in the share of women between 2012 and 2022. Overall growth rate of field is the percent change in doctorate recipients in this period in a field, including both women and men. The list of fields includes major fields and a few higher aggregates (e.g., computer and information sciences, health sciences); "All fields" is presented as a reference. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the "[Data source](#)" section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-5.

## Path to the doctorate

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Some paths to the doctoral degree are less traveled and some are more difficult to navigate, owing to a variety of influences, and these paths may lead to different postgraduate outcomes.

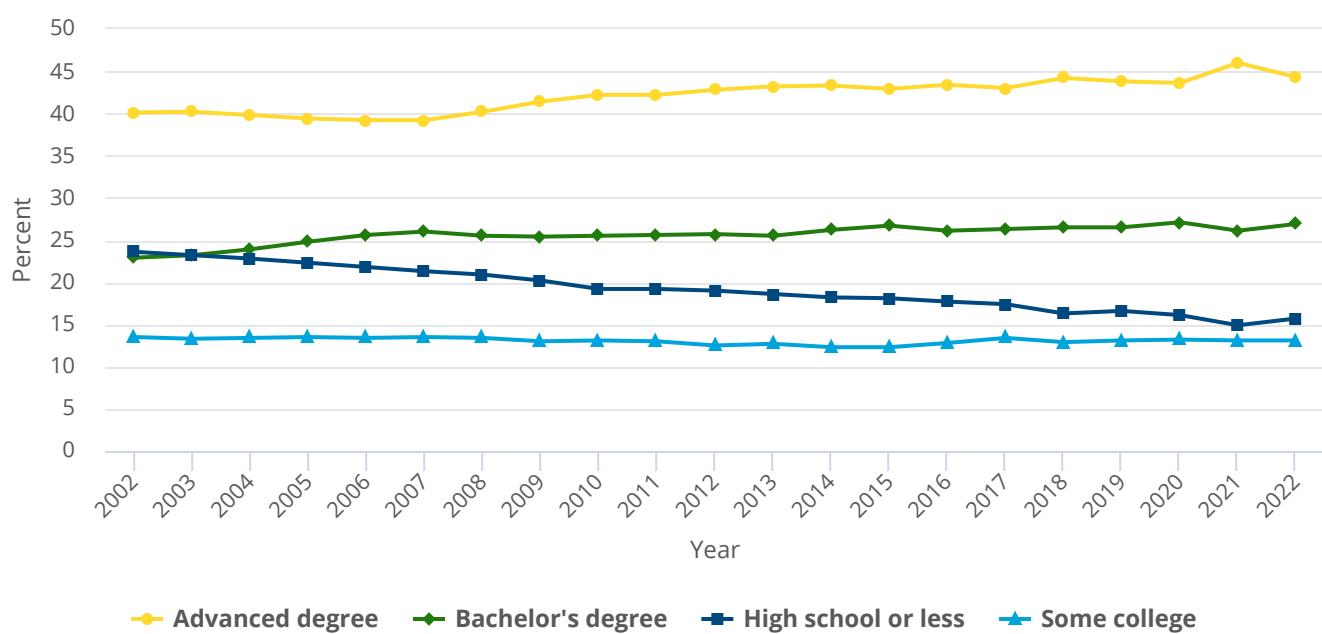
### Parental education

#### Overview

The parents of recent doctorate recipients are better educated than the parents of earlier doctorate cohorts. The proportion of doctorate recipients from families in which neither parent earned more than a high school diploma declined in the past 20 years, and the proportion of those with at least one parent with some college stayed flat. In contrast, the proportions of doctorate recipients with at least one parent holding a bachelor's degree or an advanced degree increased in the past 20 years (figure 13). Between 2020 and 2021, there was an uptick in the proportion of doctorate recipients with a parent holding an advanced degree and a decrease among those whose parents either earned no more than a high school degree or earned a bachelor's degree. However, by 2022, the proportions reverted to proportions closer to 2020.

**Figure 13**

Doctorate recipients, by highest parental educational attainment of either parent: 2002–22



**Note(s):**

Percentages are based on the number of doctorate recipients who responded to the item on the highest educational attainment for either parent and didn't report "not applicable" or "unknown" for both parents' education as their response. Percentages may not sum to 100 due to rounding and because of doctorate recipients who reported "not applicable" for both father's and mother's education beginning in 2004. Advanced degree includes master's degree, professional degree, and research doctorate.

**Source(s):**

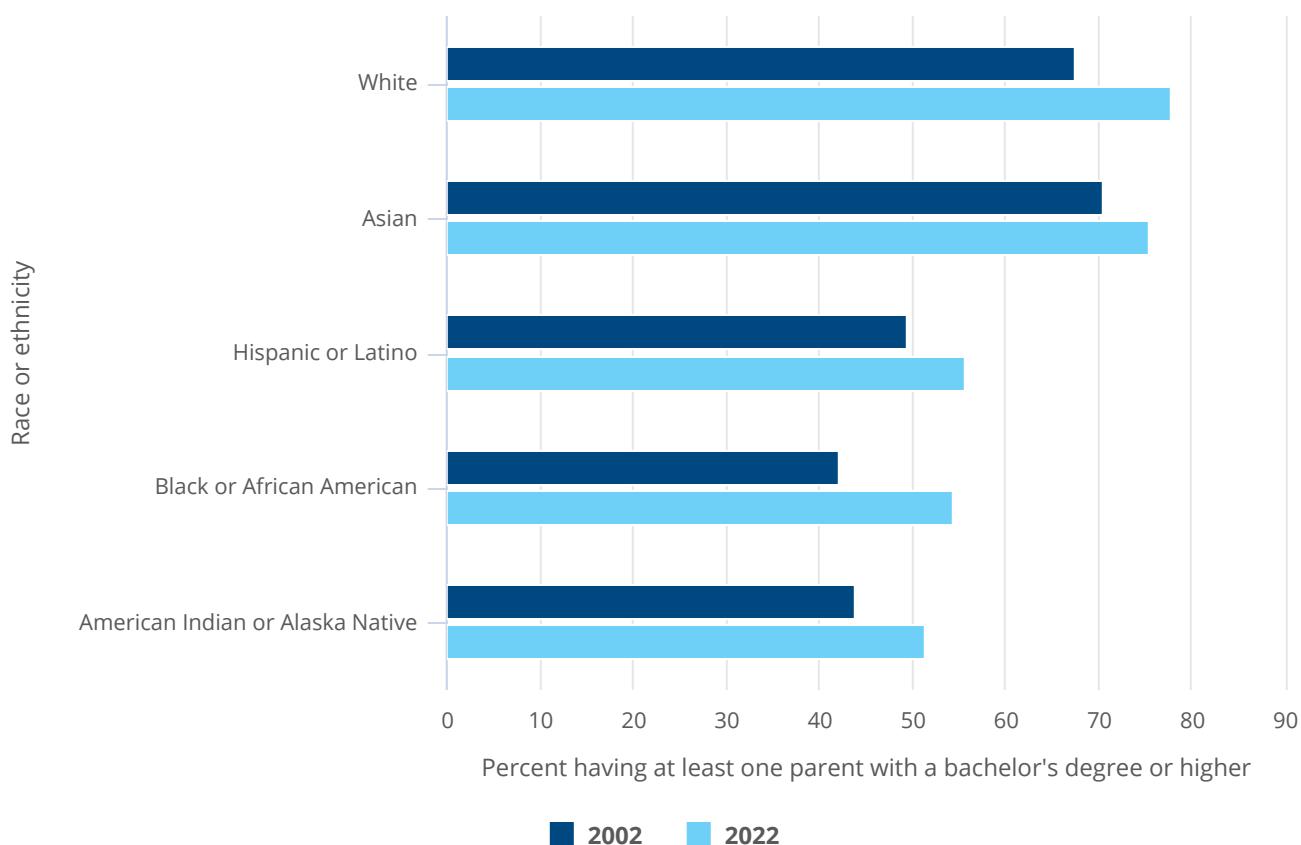
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-14 and table 5-5.

## Race and ethnicity

Between 2002 and 2022, the pattern of rising parental educational attainment was visible among all races and ethnicities for doctorate recipients who were U.S. citizens or permanent residents, with the largest increases among Black or African American (12 percentage points) and White (10 percentage points) doctorate recipients ([figure 14](#)). While parental educational attainment increased over the past 20 years, as of 2022 it was still uneven across groups. In 2022, 78% of White and 76% of Asian doctorate recipients had at least one parent who held a bachelor's degree or higher, compared with between 51% and 56% of doctorate recipients who were Black or African American, Hispanic or Latino, or American Indian or Alaska Native.

**Figure 14**

**Highest parental educational attainment of U.S. citizen and permanent resident doctorate recipients, by race or ethnicity: 2002 and 2022**



**Note(s):**

Percentages are based on the number of doctorate recipients who are U.S. citizens or permanent residents.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 5-5.

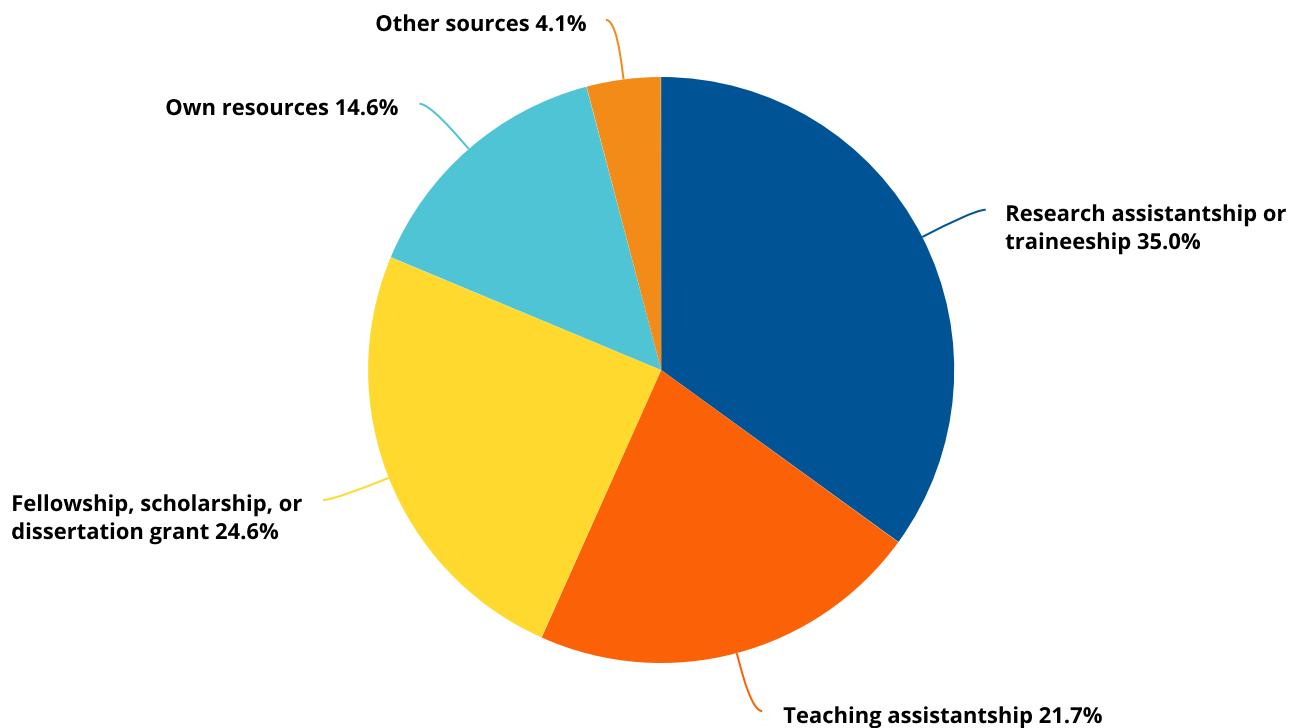
## Sources of financial support

### Overview

Most doctorate recipients received some type of funding in the pursuit of their degree. In 2022, 35% of doctorate recipients were primarily supported by research assistantships or traineeships; 25% by fellowships, scholarships, or dissertation grants; and 22% by teaching assistantships. About 15% of doctorate recipients relied primarily on their own resources—such as loans, personal savings, personal earnings, and the earnings or savings of their spouse, partner, or family—to finance their doctoral studies; 4% relied on other sources, such as employer reimbursement and foreign support ([figure 15](#)).

**Figure 15**

**Primary source of financial support for doctorate recipients: 2022**



**Note(s):**

Percentages are based on the number of doctorate recipients who responded to the primary source of financial support item. Research assistantship or traineeship includes other assistantships and internships or clinical residencies. Own resources includes loans, personal savings, personal earnings outside the institution sources listed, and earnings or savings of spouse, partner, or family. Other sources includes employer reimbursement or assistance and foreign support.

**Source(s):**

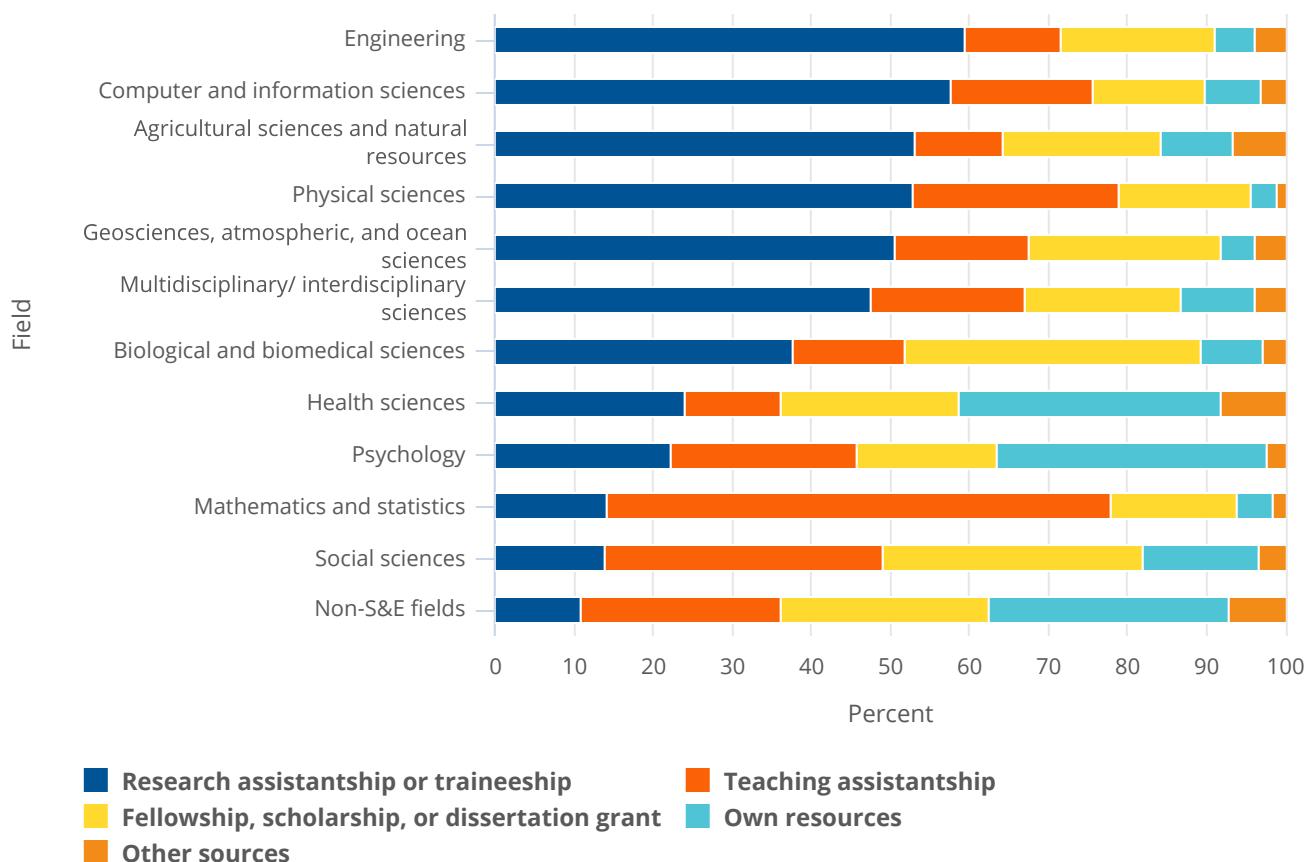
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 4-1.

## Doctorate field

Doctorate recipients' primary sources of financial support vary by broad S&E field. In 2022, research assistantships were the most common primary source of financial support for doctorate recipients in engineering; computer and information sciences; agricultural sciences and natural resources; multidisciplinary/interdisciplinary sciences; physical sciences; and geosciences, atmospheric, and ocean sciences ([figure 16](#)). In mathematics and statistics, teaching assistantships were the most frequent source of financial support. Fellowships, scholarships, or dissertation grants and research assistantships or traineeships were about as common for doctoral students in biological and biomedical sciences. About a third of doctorate recipients in health sciences and in psychology relied on their own resources as their primary source of financial support. For social sciences doctorate recipients, the most reported primary sources of financial support were teaching assistantships or fellowships, scholarships, or dissertation grants.

**Figure 16**

**Primary source of financial support for doctorate recipients, by broad field: 2022**



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of doctorate recipients who responded to the primary source of financial support item. Research assistantship or traineeship includes other assistantships and internships or clinical residencies. Own resources includes loans, personal savings, personal earnings outside the institution sources listed, and earnings or savings of spouse, partner, or family. Other sources includes employer reimbursement or assistance and foreign support. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the "[Data source](#)" section.

**Source(s):**

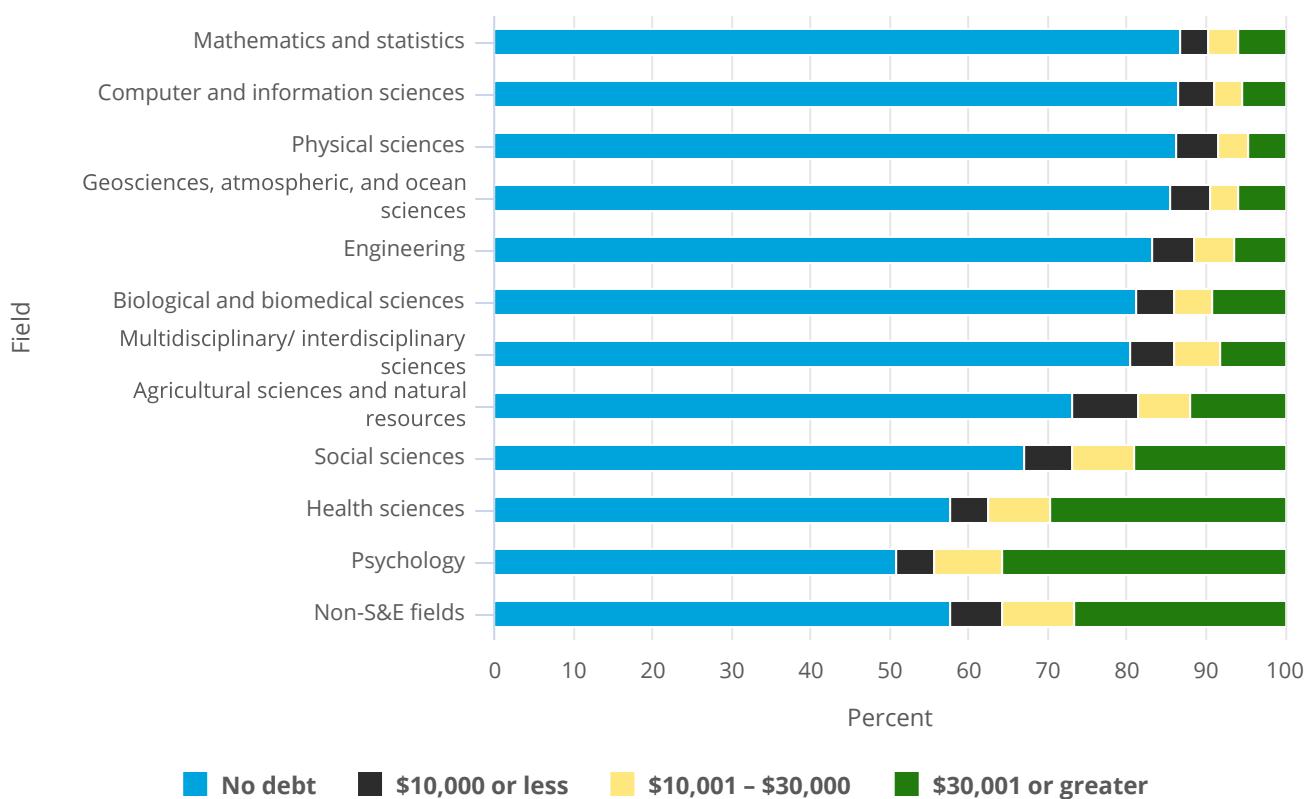
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 4-1 through table 4-3.

## Graduate debt

The amount of education-related debt incurred by doctorate recipients during graduate school is an indicator of the availability of financial support and the affordability of graduate education.<sup>14</sup> In 2022, large majorities (80% and above) of doctorate recipients in mathematics and statistics; computer and information sciences; physical sciences; geosciences, atmospheric, and ocean sciences; engineering; biological and biomedical sciences; and multidisciplinary/interdisciplinary sciences reported holding no debt related to their graduate education (figure 17). Over 85% of the doctorate recipients in these fields received support in the form of research assistantships or traineeships; fellowships, scholarships, or dissertation grants; or teaching assistantships.<sup>15</sup> In agricultural sciences, natural resources, and conservation; social sciences; health sciences; psychology; and in non-S&E fields, the proportion of doctorate recipients with no debt ranged between 51% and 73%. Within each of these broad fields, between 4% and 8% of doctorate recipients had incurred low levels of graduate debt (\$10,000 or less). The shares of doctoral recipients with graduate debt burdens over \$30,000 were greatest in psychology (36%), health sciences (29%), and non-S&E fields (27%).

**Figure 17**

Graduate debt of doctorate recipients, by broad field: 2022



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of doctorate recipients who responded to the graduate debt item (57,071 respondents). Totals may not add to 100% due to rounding. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

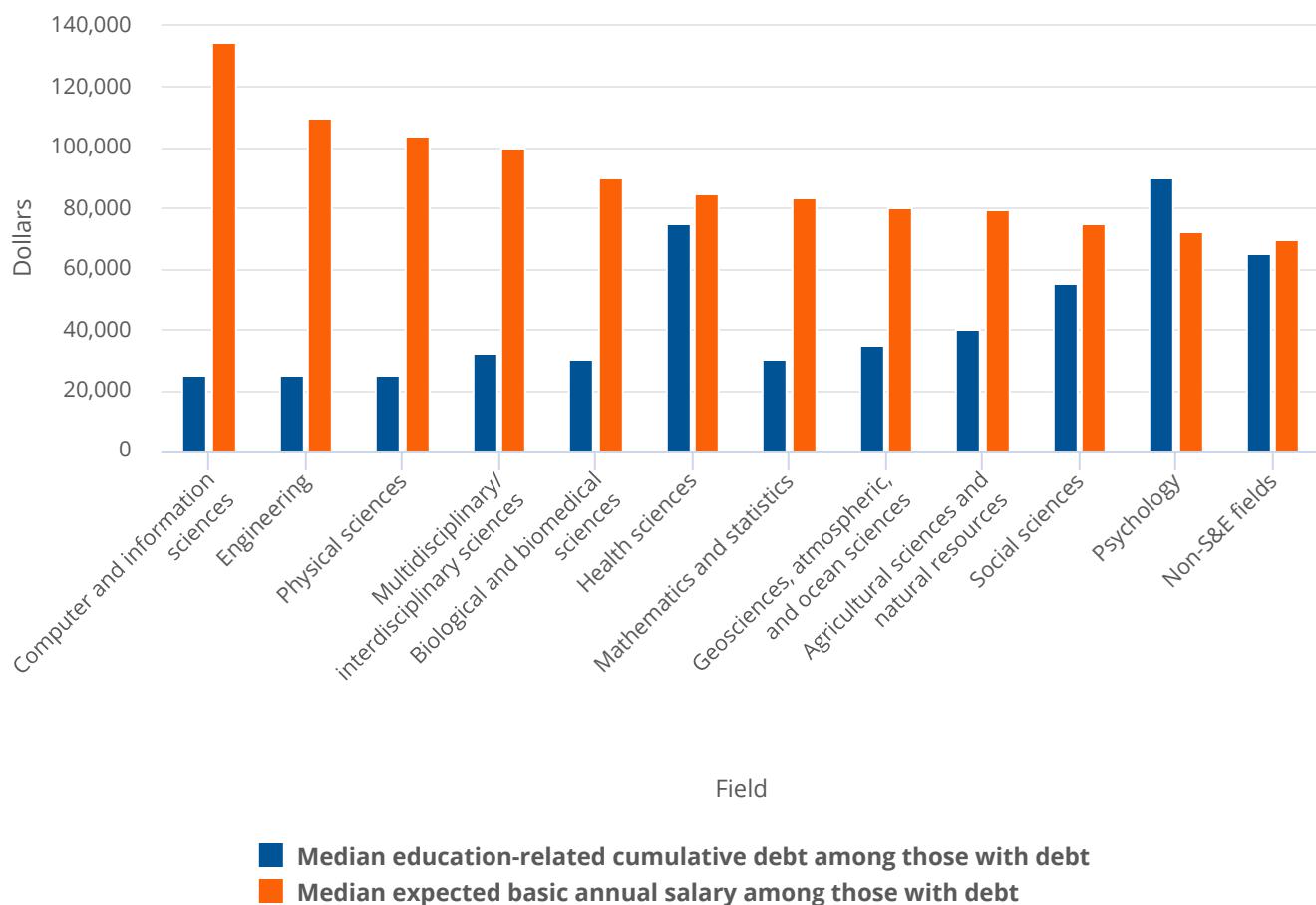
**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 4-4.

In 2022, doctorate recipients in three of the S&E fields with the lowest median education-related cumulative debt—computer and information sciences, engineering, and physical sciences—had the highest median expected annual salaries.<sup>16</sup> In these fields, median expected salaries at graduation were more than four times the median cumulative debt ([figure 18](#)). In contrast, doctorate recipients in psychology and non-S&E fields reported among the lowest median expected annual salaries. In psychology, the median cumulative debt was \$18,000 higher than the median expected salary at graduation. In non-S&E fields, the median cumulative debt was \$5,000 lower than the median expected salary.

**Figure 18**

**Median basic annual salary and median education-related cumulative debt for debt-holding doctorate recipients with definite non-postdoc employment commitments in the United States, by broad field: 2022**



S&E = science and engineering.

**Note(s):**

Definite non-postdoc employment commitment excludes postdoctoral study. Calculation of median debt excludes doctorate recipients reporting no debt. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the [“Data source” section](#).

**Source(s):**

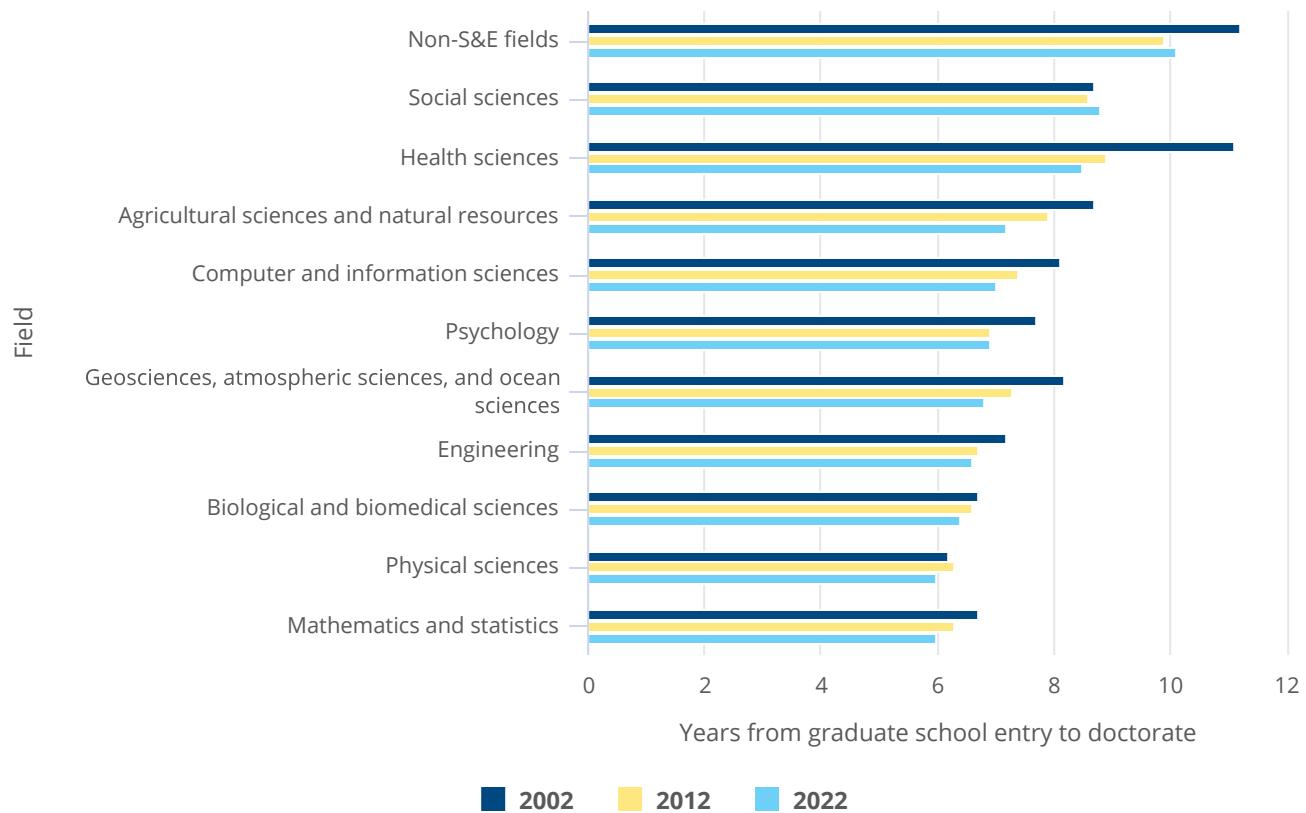
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 4-4, table 6-6, and table 6-7.

## Time to degree

Overall, earning a doctorate in non-S&E fields takes longer than earning an S&E doctorate.<sup>17</sup> In 2022, the longest median time from graduate school entry to doctoral degree in S&E fields was nearly 9 years in both health sciences and social sciences, which was lower than the 10-year median time to doctorate in non-S&E fields (figure 19). Over the past 20 years, median time to doctorate declined the most in health sciences, decreasing by about 2.5 years from 11.1 to 8.5 years, with a greater decline seen between 2002 and 2012 than in the following 10 years. Median time to doctorate in agricultural sciences and natural resources; computer and information sciences; and geosciences, atmospheric sciences, and ocean sciences declined between 1 to 1.5 years over the past 2 decades. Median time to doctorate in psychology; engineering, biological and biomedical sciences; mathematics and statistics; and physical sciences decreased by less than a year over the same time period. Non-S&E fields declined about a year from 11.2 to 10.1 years between 2002 and 2022.

**Figure 19**

**Median time to degree of doctorate recipients, by trend broad field: 2002–22**



S&E = science and engineering.

**Note(s):**

The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 1-12.

## Postgraduation trends

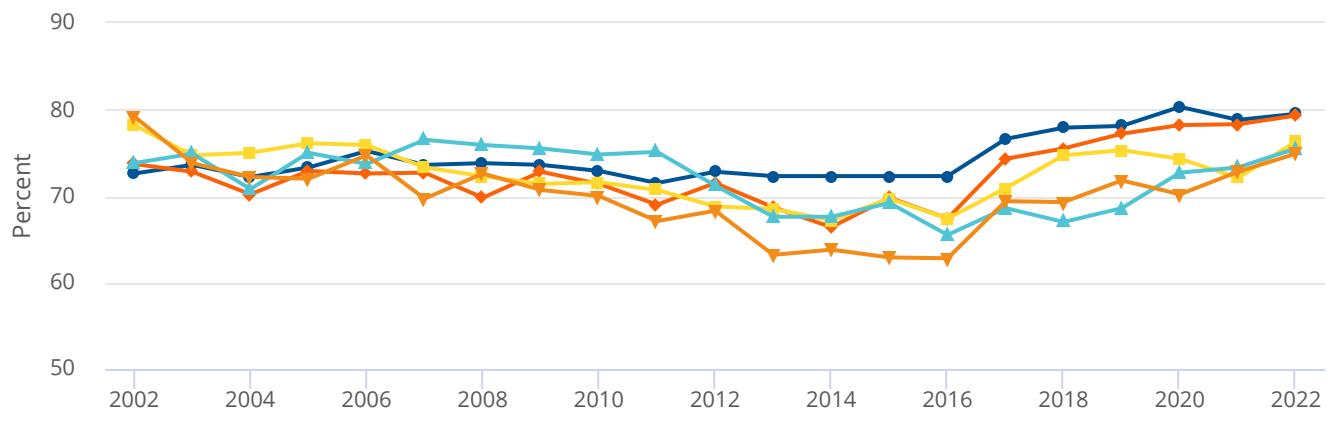
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A graduate's first position after earning their doctoral degree may reflect broad economic conditions and can shape later career opportunities, earnings, and choices. Over the longer term, the early career patterns of doctorate recipients may influence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

### Definite commitments at graduation

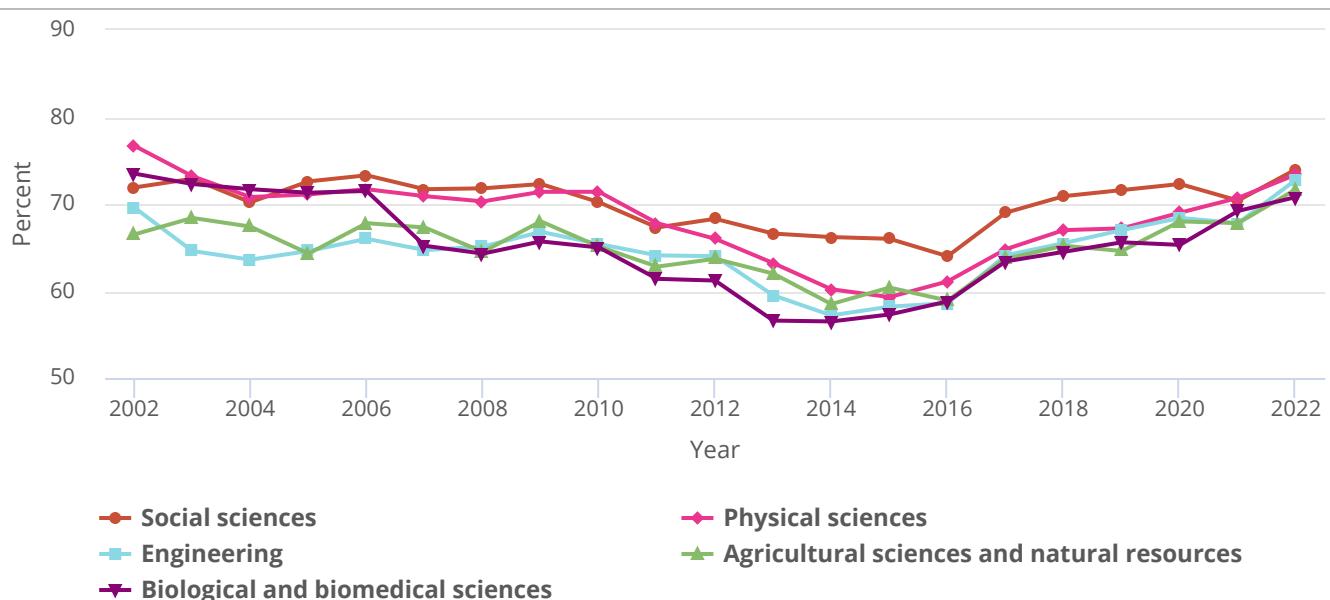
At any given time, the job market outlook for new doctorate recipients will be better in some doctorate fields than in others. Though all fields tend to follow patterns that generally reflect overall trends in economic conditions, definite commitments at graduation are likely to be influenced by many factors.<sup>18</sup> In general, doctorate recipients in S&E fields tend to have robust postgraduation career prospects. The proportions of 2022 doctorate recipients in S&E with definite commitments, including postdoctoral study (postdoc) positions, ranged from 71% and 72% in biological and biomedical sciences and in agricultural sciences to 79% and 80% in computer and information sciences and in psychology ([figure 20](#)). In 2022, the proportions of computer and information sciences and psychology doctorate recipients with definite commitments were at or near their all-time high.

In several S&E broad fields, the proportion of doctorate recipients with definite commitments at graduation was lower compared with 20 years ago. The fields with declines between 2002 and 2022 were in health sciences (from 79% to 75%), physical sciences (from 77% to 73%), biological and biomedical sciences (from 74% to 71%), and mathematics and statistics (from 78% to 76%). Since 2021, the proportion of doctorate recipients with definite commitments increased in all fields. The largest percentage-point increases in definite commitments were in engineering; mathematics and statistics; agricultural sciences and natural resources; and social sciences. (For more details on the effects of the pandemic on definite commitments, see section "[Special focus: COVID-19 pandemic impacts on doctorate recipients](#)"). Between 2002 and 2022 the proportion of doctorate recipients in non-S&E fields reporting definite commitments declined in humanities and arts and business, with a bottoming out of all non-S&E fields from 2014 to 2016 ([figure 21](#)). Doctorate recipients in non-S&E broad fields experienced another drop between 2020 and 2021 during the pandemic, but these fields rebounded from those declines by 2022.

**Figure 20****Definite commitments among doctorate recipients, by S&E trend broad field: 2002–22**

—●— Psychology  
—■— Mathematics and statistics  
—△— Geosciences, atmospheric sciences, and ocean sciences  
—◆— Computer and information sciences  
—▲— Health sciences

—◆— Computer and information sciences  
—△— Geosciences, atmospheric sciences, and ocean sciences  
—▲— Health sciences



—●— Social sciences  
—□— Engineering  
—◆— Physical sciences  
—△— Agricultural sciences and natural resources  
—▲— Biological and biomedical sciences

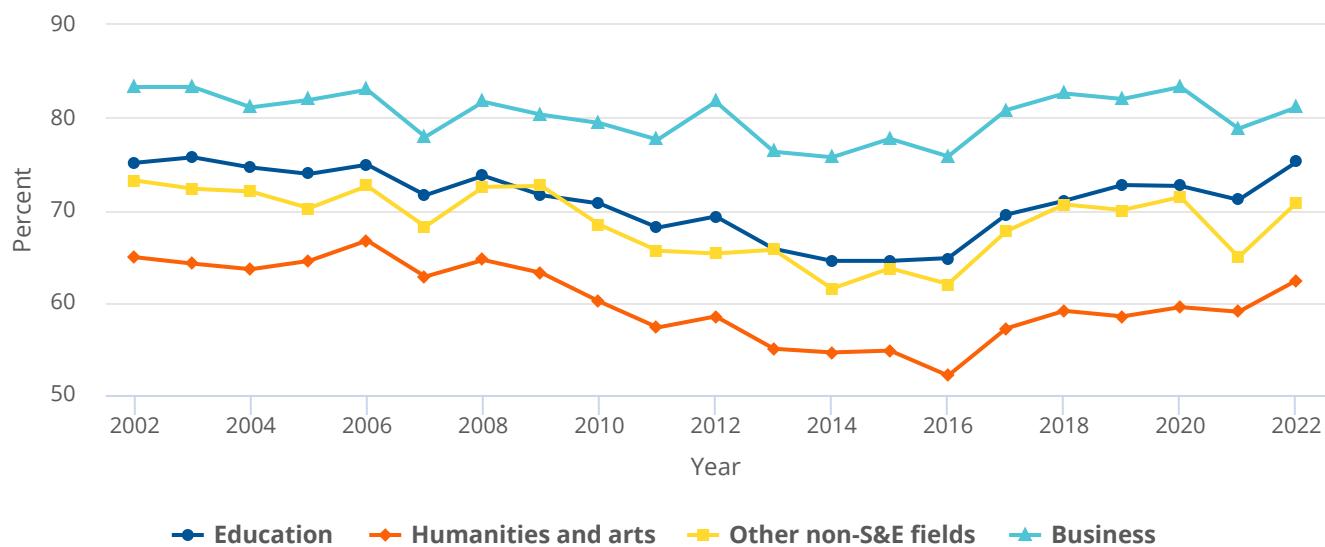
S&E = science and engineering.

**Note(s):**

Definite commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment or postdoctoral study in the coming year. Percentages are based on the number of doctorate recipients who responded to the postgraduation status item. The postgraduation status question was changed in 2017 to capture the postgraduation employment plans more accurately. As a result, some of the increase between 2016 and 2017 may be partly attributable to this change. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “Data source” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 2-1.

**Figure 21****Definite commitments among doctorate recipients, by non-S&E trend broad field: 2002–22**

S&E = science and engineering.

**Note(s):**

Definite commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment or postdoctoral study in the coming year. Percentages are based on the number of doctorate recipients who responded to the postgraduation status item. The postgraduation status question was changed in 2017 to capture the postgraduation employment plans more accurately. As a result, some of the increase between 2016 and 2017 may be partly attributable to this change. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

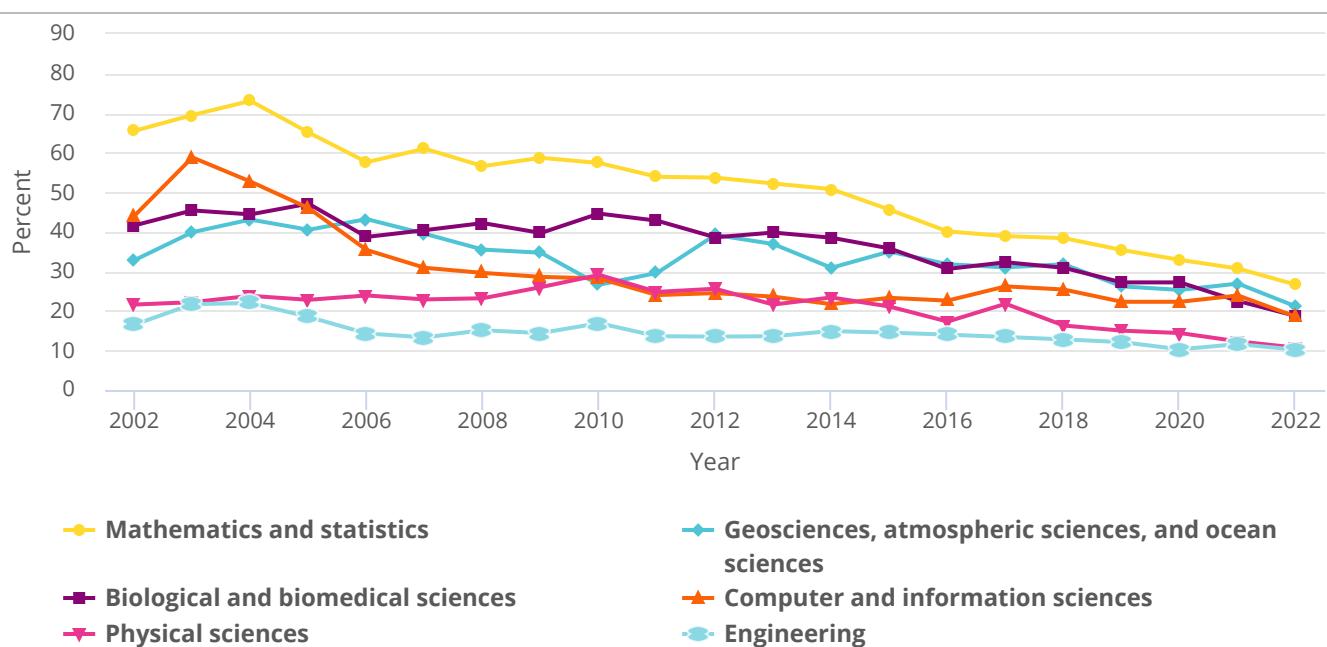
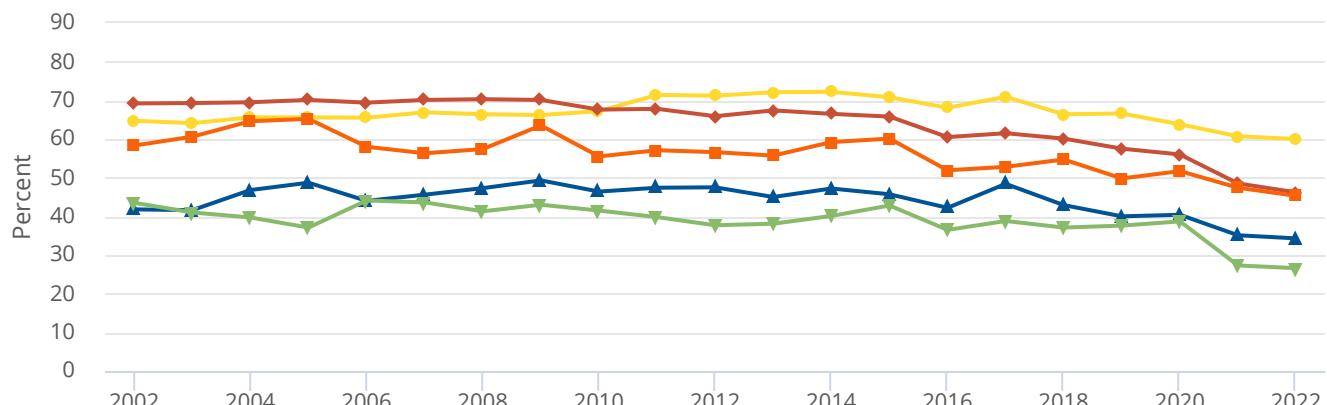
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 2-1

## First postgraduate employment

### Academic employment

Doctorate recipients have shifted away from academic employment over time. In 2022, 33% of doctorate recipients with definite non-postdoc employment commitments in the United States reported that their principal job would be in academe,<sup>19</sup> down from 52% in 2002. The highest rates of non-postdoc academic employment commitments in 2022 were reported by doctorate recipients in non-S&E fields (60%) and the lowest rates were in engineering (10%) and in physical sciences (11%) ([figure 22](#)).

In the past 20 years, the proportion of non-postdoc academic employment commitments in the United States declined in all S&E fields. The largest decline was in mathematics and statistics, from 66% in 2002 to 27% in 2022. Between 2021 and 2022, the proportion of doctorate recipients with non-postdoc academic employment commitments dropped in all S&E fields, particularly in geosciences, atmospheric, and ocean sciences (6 percentage points) and computer and information sciences (5 percentage points); the smallest declines were in agricultural sciences and natural resources and in psychology (less than 1 percentage point each).

**Figure 22****Definite non-postdoc employment commitments in academe in the United States, by trend broad field: 2002–22**

S&amp;E = science and engineering.

**Note(s):**

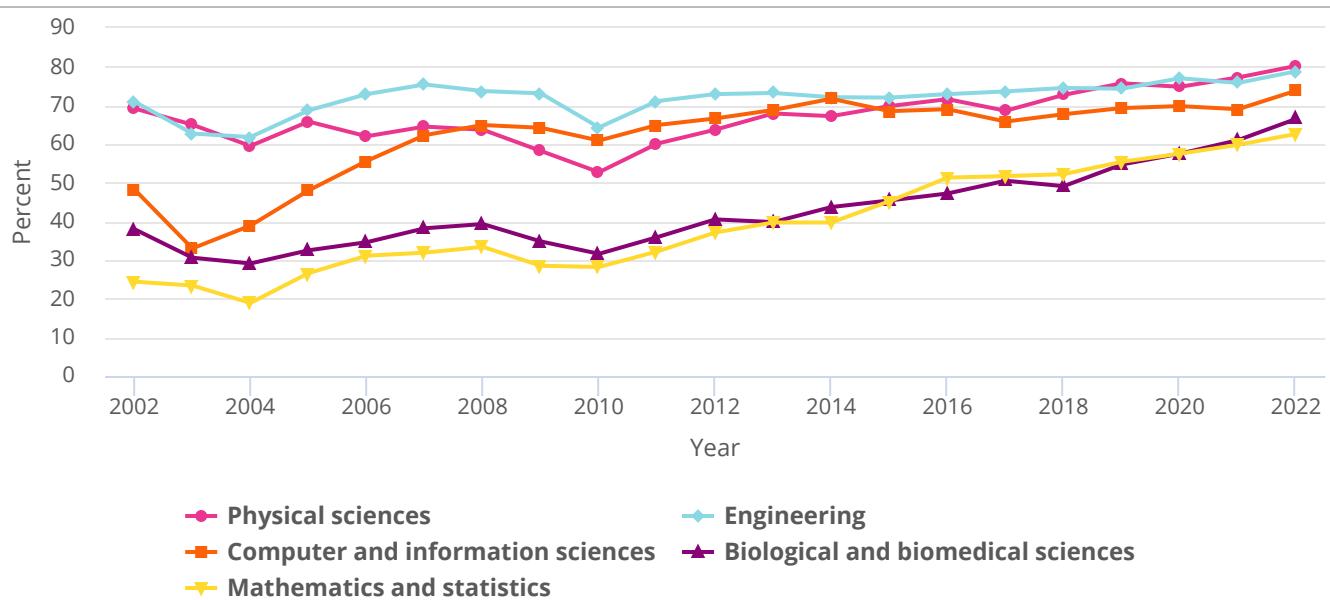
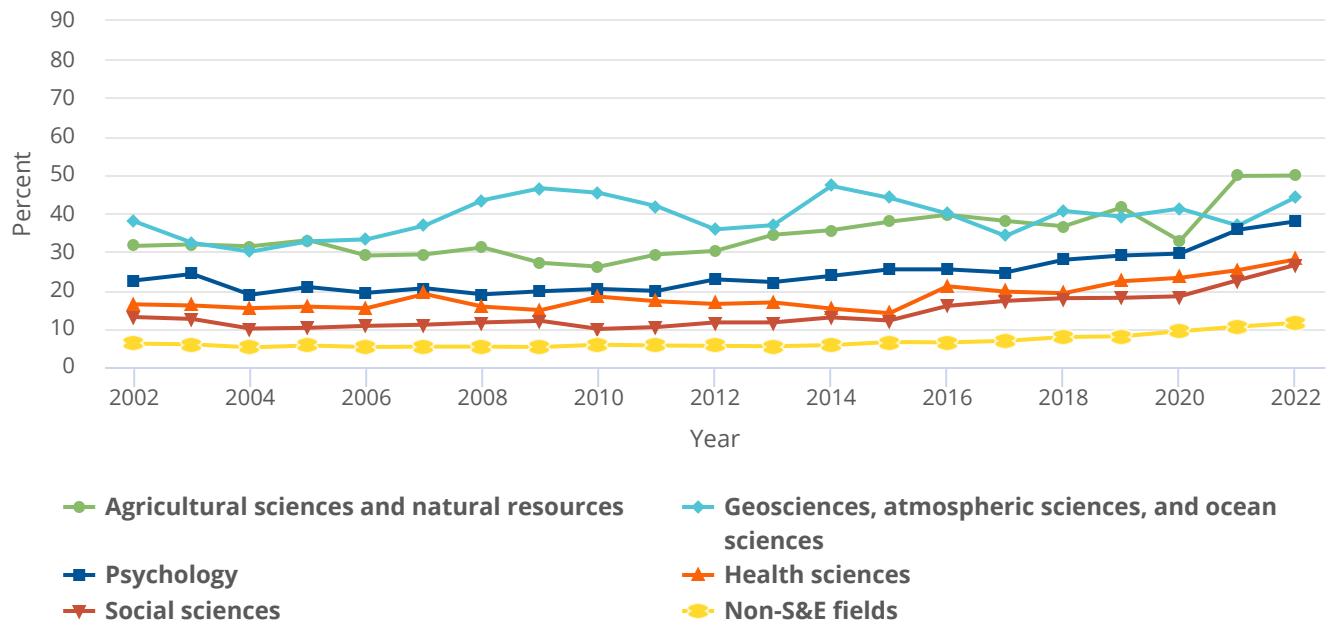
Definite employment commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment (excludes postdoctoral study) in the coming year. Percentages are based on the number of doctorate recipients who reported definite employment commitments (including those missing employer type) and plans to stay in the United States. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 2-6.

## Industry or business employment

In contrast to the decline in definite non-postdoc employment commitments in academia, the proportion of doctorate recipients with job commitments in industry or business in the United States doubled since 2002, comprising close to half of all employment commitments of doctorate recipients in 2022.<sup>20</sup> Definite commitments in industry and business have become more popular across all fields. In 2002, only physical sciences (69%) and engineering (71%) had more than half of their doctorate recipients commit to industry or business positions at graduation ([figure 23](#)). By 2022, several more fields had 50% or more of their doctorate recipients commit to industry or business positions: computer and information sciences; biological and biomedical sciences; mathematics and statistics; and agricultural sciences and natural resources. In comparison, only about a quarter (27%) of doctorate recipients in social sciences had definite commitments in industry or business—the lowest among S&E fields. Between 2021 and 2022, the largest increases were in geosciences, atmospheric, and ocean sciences (7 percentage points); biological and biomedical sciences (6 percentage points); and computer and information sciences (5 percentage points).

**Figure 23****Definite non-postdoc employment commitments in industry or business in the United States, by trend broad field: 2002–22**

S&amp;E = science and engineering.

**Note(s):**

Definite employment commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment (excludes postdoctoral study) in the coming year. Definite commitments in industry or business includes doctorate recipients who are self-employed. Percentages are based on the number of doctorate recipients who reported definite employment commitments (including those missing employer type) and plans to stay in the United States. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 2-6.

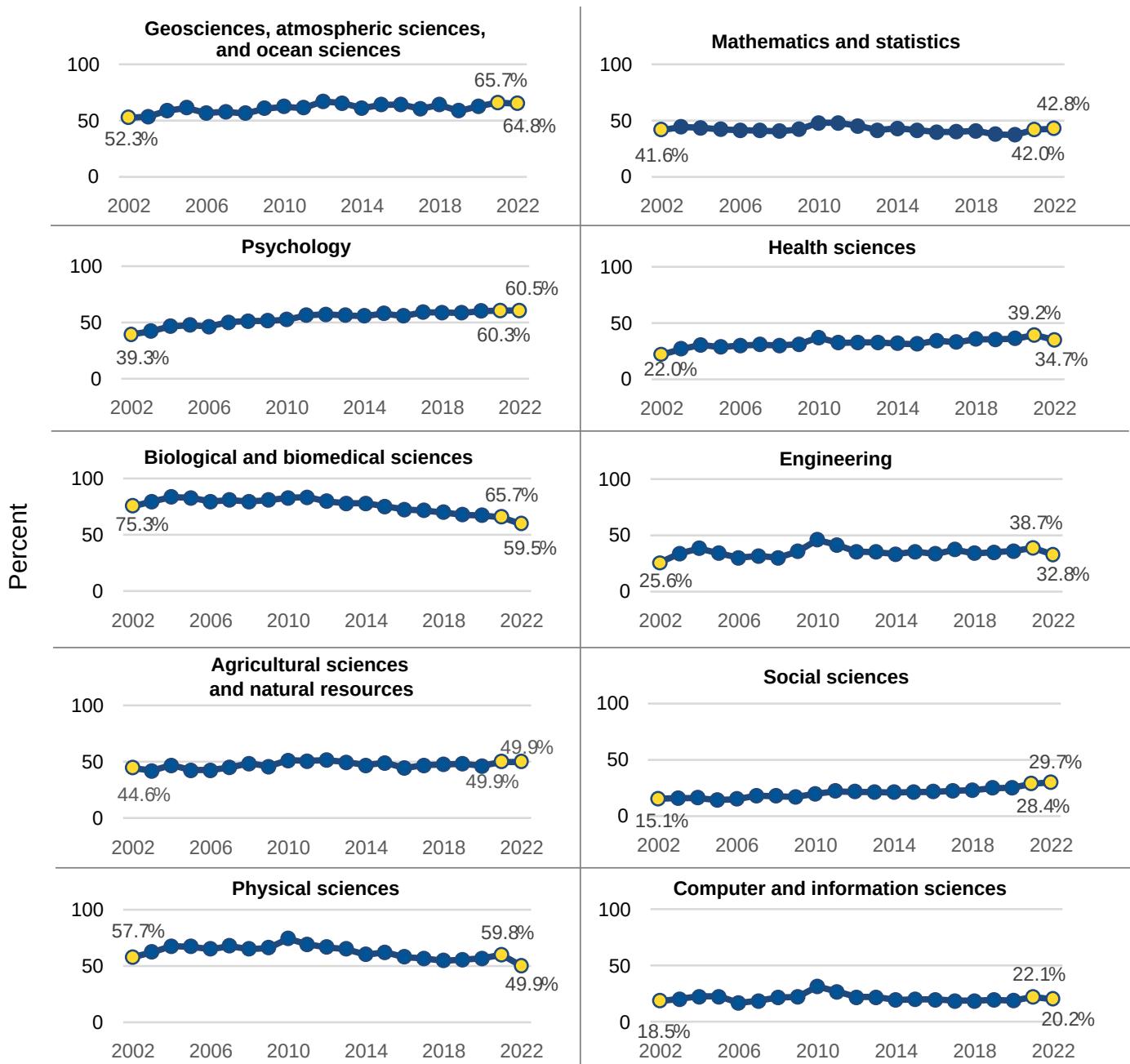
## Postdoc positions

Historically, postdoc positions have been a customary part of the early career paths of doctorate recipients in biological and biomedical sciences; physical sciences; and geosciences, atmospheric, and ocean sciences, comprising over half of definite commitments. By 2022, the postdoc rates in psychology and in agricultural sciences and natural resources had also reached or exceeded 50% ([figure 24](#)). In the past 20 years, the largest increases in postdoc rates were in psychology (21 percentage point), social sciences (15 percentage points), and health sciences (13 percentage points), though the proportions of doctorate recipients with postdoc positions in the latter two fields were no more than 35% in 2022. The only fields to experience a decline over the past 20 years were biological and biomedical sciences and physical sciences.

Between 2021 and 2022, the postdoc rate decreased in most S&E fields. The largest declines were in physical sciences, biological and biomedical sciences, engineering, and health sciences. Only psychology, mathematics and statistics, and social sciences saw gains, ranging from 0.2 to 1.3 percentage points.

**Figure 24**

S&amp;E U.S. postdoc rate for doctorate recipients, by trend broad field: 2002–22



S&amp;E = science and engineering.

**Note(s):**

Percentages are based on the number of doctorate recipients who reported definite commitments in the coming year, who reported whether their commitment was for employment or postdoctoral study, and who plan to live in the United States. Beginning in 2021, a modified version of the 2020 Classification of Instructional Programs (CIP) codes was used in the survey data collection. For trend analysis, a set of trend broad fields was constructed to bridge the historical fields and the SED-CIP taxonomy. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

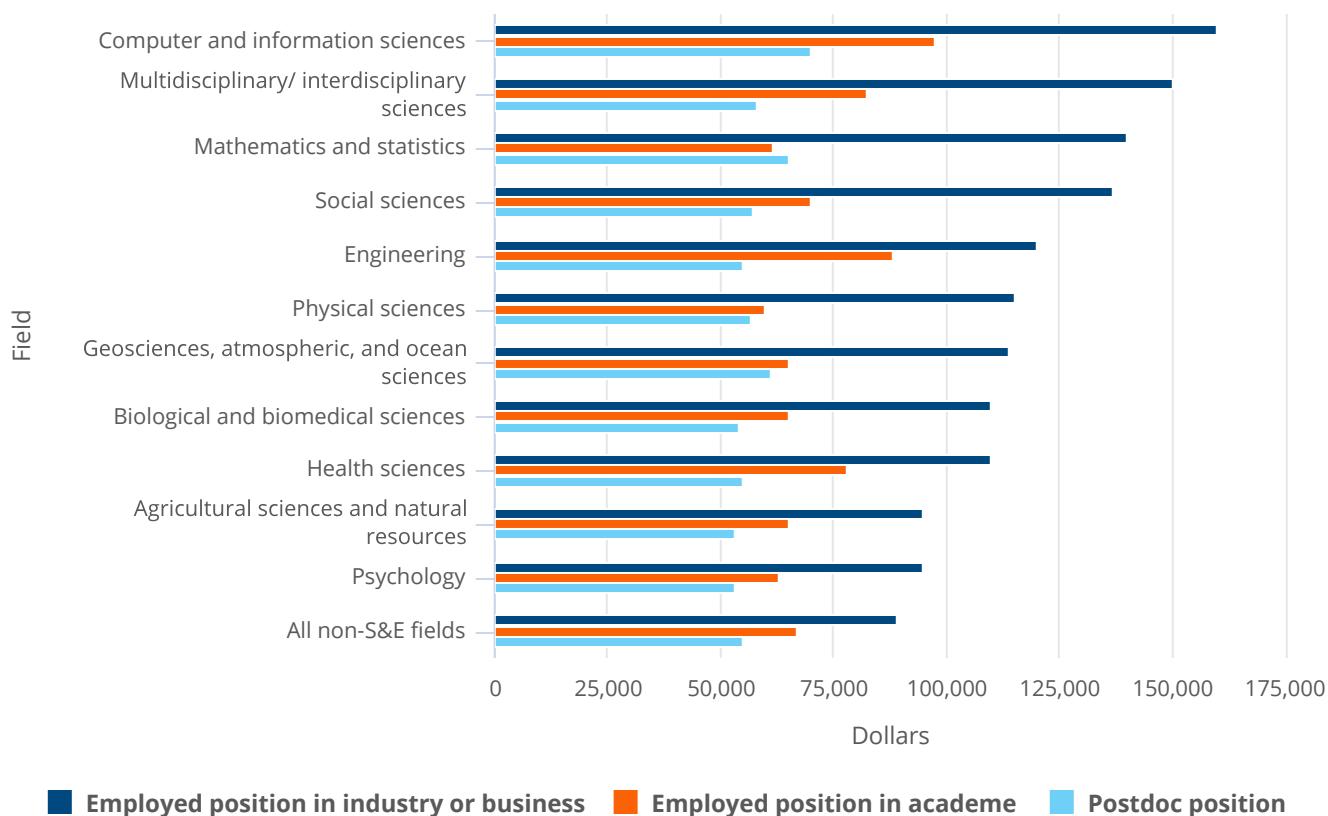
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 2-3.

## Median salaries

In 2022, doctorate recipients who had definite commitments for employment or a postdoc in the United States at graduation reported expected annual salaries that varied by their doctorate field and the type of position to which they committed. In every field, expected median salaries for doctorate recipients committing to non-postdoc jobs in industry<sup>21</sup> were higher than those committing to postdocs and non-postdoc employment in the academic sector ([figure 25](#)). The expected median salaries for postdocs in most broad fields were relatively similar, ranging from \$50,000 to \$58,000. Postdocs in geosciences, atmospheric and ocean sciences; mathematics and statistics; and computer and information sciences were the exception, with median salaries between \$61,000 and \$70,000. Doctorate recipients in computer and information sciences reported the highest expected median salaries in academe (\$97,500) and in industry (\$160,000).

**Figure 25**

**Median annual salary of doctorate recipients with definite commitments in the United States, by position type and broad field: 2022**



S&E = science and engineering.

**Note(s):**

Definite commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment or postdoctoral study in the coming year and plans to stay in the United States. Industry includes all nonacademic sectors, including self-employment, private for-profit and private nonprofit, and government. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

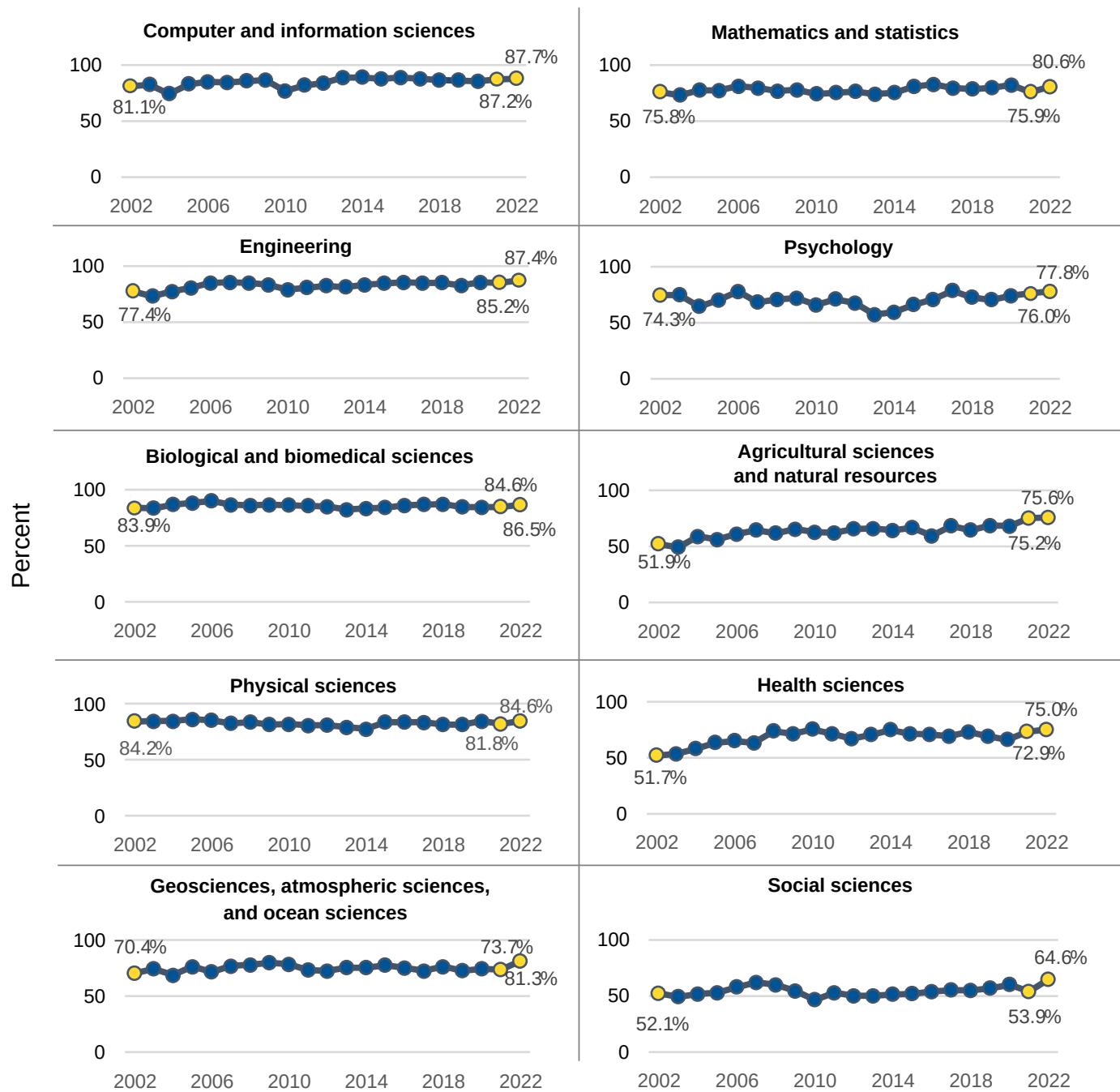
**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 6-6 and table 6-7.

## Temporary visa holders and postgraduation

Among S&E doctorate recipients who are temporary visa holders, working in the United States after earning their doctoral degree has been a growing trend. In 2022, 83% of S&E temporary visa holder doctorate recipients with definite commitments reported that the location of their postdoc or employment position was in the United States, up from 74% in 2002.<sup>22</sup> In the past 20 years, expected stay rates increased the most in agricultural sciences and natural resources and in health sciences; stay rates increased the least in physical sciences ([figure 26](#)).

In 2022, expected stay rates were highest (above 80%) in many S&E fields but lowest in social sciences (65%). Between 2021 and 2022, the proportion of temporary visa holder doctorate recipients with definite commitments in the United States grew in all fields. The largest increases were in social sciences (from 54% to 65%); geosciences, atmospheric, and ocean sciences (from 74% to 81%); and mathematics and statistics (from 76% to 81%).

**Figure 26****S&E temporary visa holder doctorate recipients with definite commitments in the United States, by trend broad field: 2002–22**

S&amp;E = science and engineering.

**Note(s):**

Definite commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment or postdoctoral study in the coming year. The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022. Related detailed table 6-3.

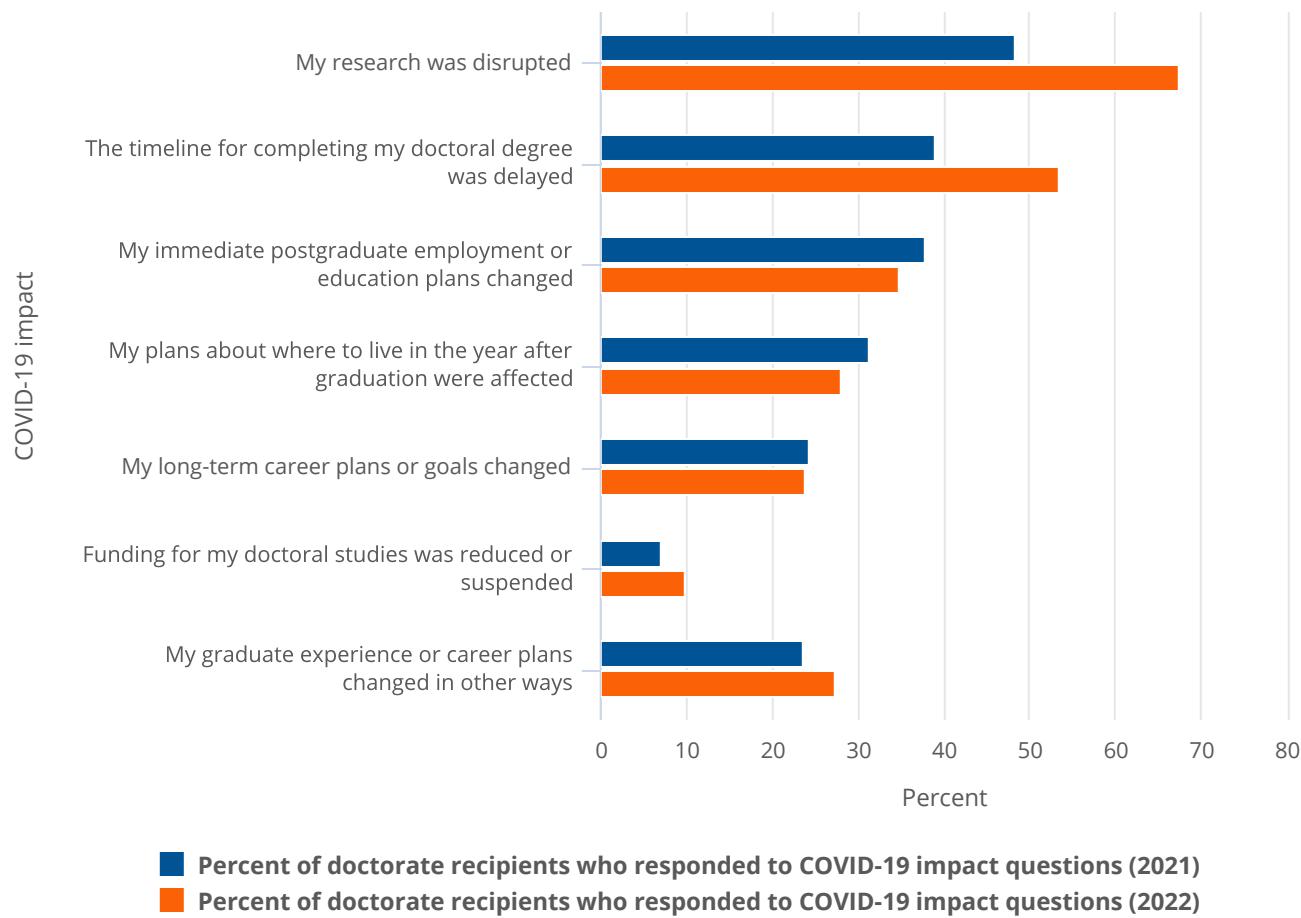
## Special focus: COVID-19 pandemic impacts on doctorate recipients

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The COVID-19 pandemic continued to disrupt many aspects of the graduate education and training of doctorate recipients in 2022.<sup>23</sup> Doctorate recipients were asked whether they experienced one of six impact areas as a result of the pandemic: delay in their doctoral degree completion timeline; disruption in their research; reduction or suspension of their doctoral studies; change in their immediate postgraduate employment or education plans; change in longer-term career plans or goals; or change in their plans about where to live in the year after graduation. Respondents were also asked to report any other changes to their graduate experience or career plans. In 2022, 51,063 of the 57,596 doctorate recipients (89%) responded to the COVID-19 pandemic impact questions. This section summarizes the data from this population.

### Overall impacts of the COVID-19 pandemic on 2022 doctorate recipients

In the 2022 academic year, doctorate recipients encountered multiple challenges from the ongoing COVID-19 pandemic. Disruption in research was the most frequent impact of the COVID-19 pandemic, cited by 67% of respondents—an increase from 48% reported in 2021 ([figure 27](#)). Of those whose research was disrupted, 81% indicated they had limited or no access to resources needed for research and two-thirds reported they had to make changes to their research plan ([table B](#)).<sup>24</sup> The second most frequent impact in 2022 was a delay in the timeline for completing the doctoral degree, cited by 53% of doctorate recipients—an increase from the 39% reported in 2021.

**Figure 27****COVID-19 pandemic impacts among doctorate recipients: 2021 and 2022****Note(s):**

Percentages are based on the number of doctorate recipients who responded to the COVID-19 impact questions (42,060 respondents in 2021; 51,063 respondents in 2022).

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

**Table B****Doctorate recipients who said their research was disrupted as a result of the COVID-19 pandemic, by type of disruption: 2022**

(Number and percent)

Type of disruption	Number and percent
My research was disrupted (number)	34,429
Limited or no access to resources (%)	80.9
Changed my research plan (%)	65.5
Disrupted in other ways (%)	16.2

**Note(s):**

Multiple responses allowed.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

In addition, short- and long-term postgraduation plans continued to be affected by the pandemic in 2022, with 35% of doctorate recipients indicating their immediate postgraduation employment or education plans had changed (38% in 2021). Of these doctorate recipients, 78% attributed the changes to limited job opportunities, 36% indicated they had to accept a less-desirable job, and 20% reported they had changed plans in other ways ([table C](#)).<sup>25</sup> In 2022, over a quarter (28%) of doctorate recipients said their plans about where to live in the year after graduation had been affected (31% in 2021), and 24% said that their long-term career plans or goals had changed (similar to 2021) ([figure 27](#)). Among the latter, 55% mentioned they had changed their long-term career plans or goals for a different type of job or field, 54% for a different type of employer, 42% for new opportunities, and 14% for other kinds of career ([table D](#)).<sup>26</sup>

#### **Table C**

##### **Doctorate recipients who said their immediate postgraduate employment or education plans changed as a result of the COVID-19 pandemic, by type of change: 2022**

(Number and percent)

Type of change	Number and percent
My immediate postgraduate employment or education plans changed (number)	17,743
Limited job opportunities (%)	78.1
Had to accept a less-desirable job (%)	35.6
Changed plans in other ways (%)	19.8

**Note(s):**

Multiple responses allowed.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

#### **Table D**

##### **Doctorate recipients who said their long-term career plans or goals changed as a result of the COVID-19 pandemic, by type of change: 2022**

(Number and percent)

Type of change	Number and percent
My long-term career plans or goals changed (number)	12,090
Different type of job or field (%)	55.2
Different type of employer (%)	54.4
New opportunities (%)	42.3
Changed plans in other ways (%)	13.6

**Note(s):**

Multiple responses allowed.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

The pandemic also had a financial impact on doctorate recipients. In 2022, 10% reported that funding for their doctoral studies had been reduced or suspended (versus 7% in 2021). For most sources of funding, the proportion of doctorate recipients who mentioned their graduate school funding was reduced or suspended did not vary by the primary source of funding they had received. However, a larger proportion of those whose funding had been impacted by the pandemic relied on teaching assistantships as their primary financial support source (28%) than those whose funding had not been impacted by the pandemic (21%).<sup>27</sup>

In 2022, the vast majority of doctorate recipients (89%) responding to the COVID-19 pandemic impact questions reported their graduate experience and career plans were affected by at least one of the impacts detailed above—an increase from 77% in 2021.<sup>28</sup>

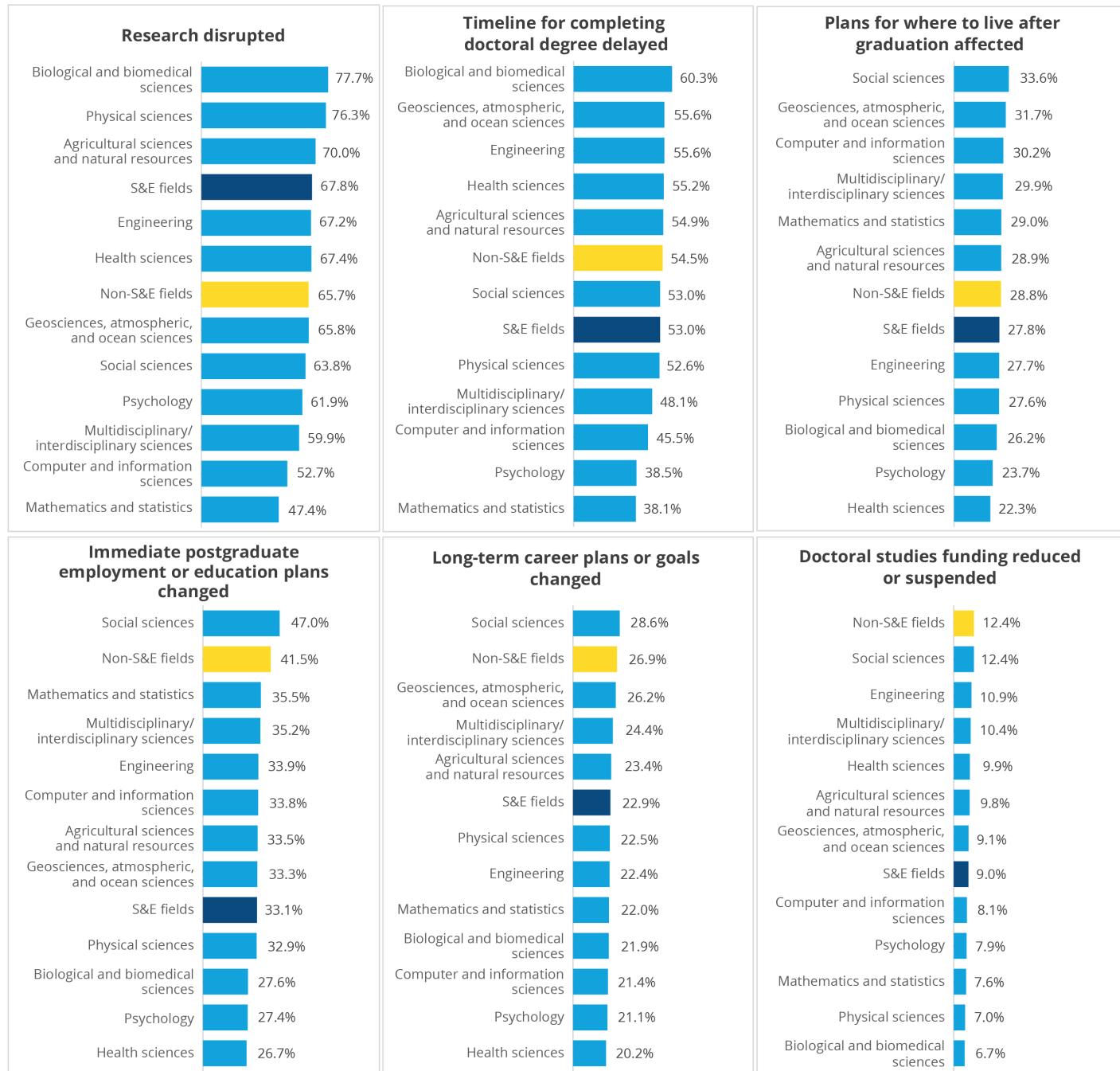
## COVID-19 pandemic impacts by doctorate field

The impact of the COVID-19 pandemic varied by broad field. Doctorate recipients in fields where laboratories, equipment, and other facilities are indispensable—such as biological and biomedical sciences and physical sciences within S&E ([figure 28](#)) and visual and performing arts within non-S&E fields ([figure 29](#))—reported the highest levels of disruption to their research. In contrast, those in mathematics and statistics and computer and information sciences reported the lowest levels of research disruption. Over half of doctorate recipients in most S&E fields reported delays in their doctoral degree completion timeline. Delays were more prevalent in biological and biomedical sciences (60%) than in mathematics and statistics (38%) and psychology (38%).

The impact of the COVID-19 pandemic on doctorate recipients' short- and long-term postgraduation plans also varied by field. A larger proportion of doctorate recipients in social sciences (34%) indicated that their plans about where to live in the year after graduation were affected, compared with their counterparts in health sciences (22%) and in psychology (24%). Doctorate recipients in health sciences, psychology, and biological and biomedical sciences were the least affected by the COVID-19 pandemic in terms of their immediate postgraduate employment or education plans. A slightly larger proportion of doctorate recipients in social sciences than in other S&E fields mentioned that the pandemic impacted their long-term career plans or goals.

Although the pandemic's impact on funding was the lowest of all impact areas overall, the proportion of doctorate recipients who indicated their funding was reduced or suspended was larger in non-S&E fields (12%) than in all S&E fields except social sciences (12%). The fields least affected in terms of funding were biological and biomedical sciences (7%) and physical sciences (7%).

Among non-S&E doctorate recipients, those in visual and performing arts reported the highest disruption in research (74%) ([figure 29](#)). A similar pattern is observed regarding the pandemic's impact on their immediate postgraduate employment or education plans, their long-term career plans or goals, and the funding for their doctoral studies. Lower proportions of doctorate recipients in business indicated that their research was disrupted or their timeline for the completion of their studies had been delayed than those in other non-S&E broad fields. Similarly, doctorate recipients in education least frequently indicated impacts on their plans about where to live in the year after graduation, immediate postgraduate employment or education plans, or long-term career plans.

**Figure 28****COVID-19 pandemic impacts among doctorate recipients, by broad field: 2022**

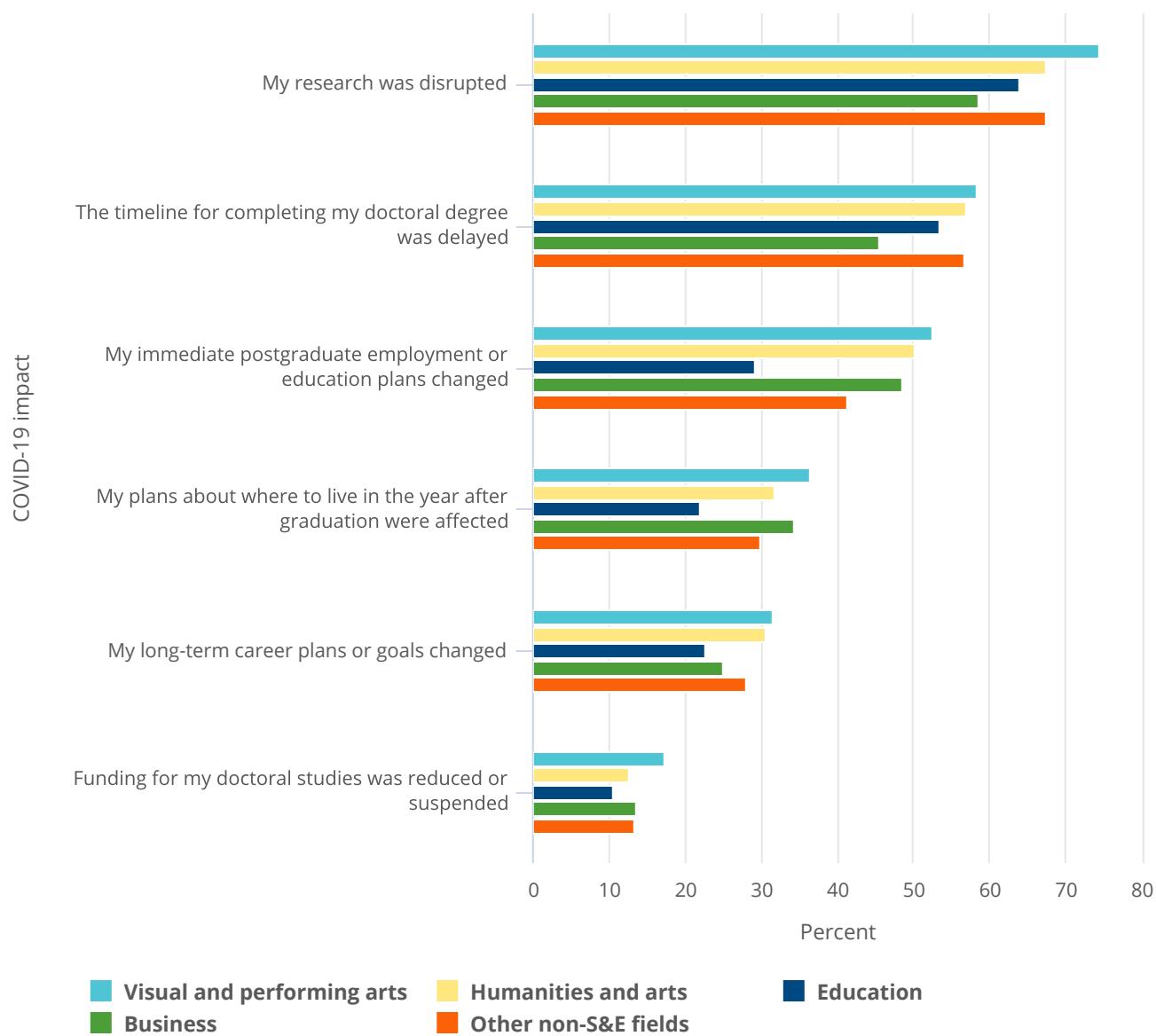
S&E = science and engineering.

**Note(s):**

Percentages are based on the number of doctorate recipients who responded to COVID-19 impact questions (51,063 respondents). The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

**Figure 29****COVID-19 pandemic impacts among non-S&E doctorate recipients, by broad field: 2022**

S&E = science and engineering.

**Note(s):**

Percentages are based on the number of non-S&E doctorate recipients who responded to the COVID-19 impact questions (10,089 respondents). The survey data collection for field of study changed in 2021, which may affect the data comparability across years. For more information, see the “[Data source](#)” section.

**Source(s):**

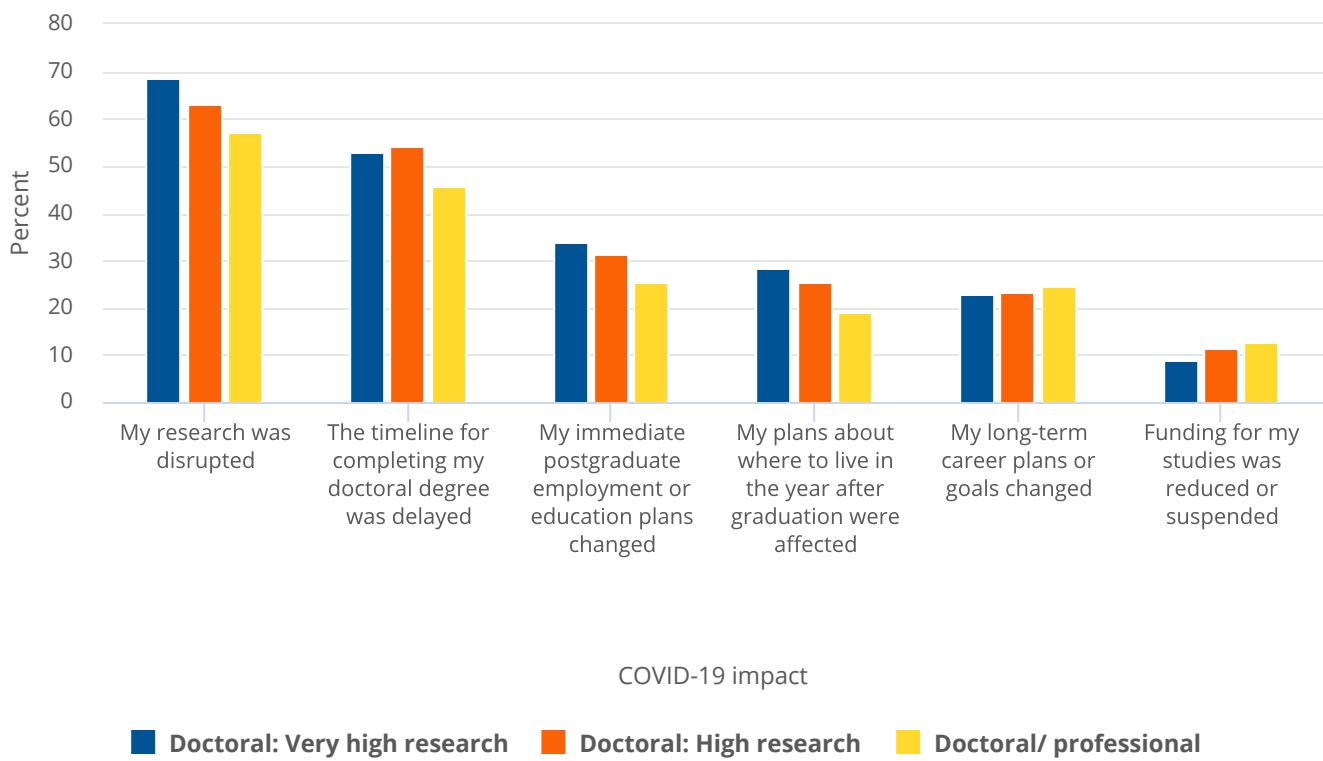
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

## COVID-19 pandemic impacts by Carnegie classification of S&E doctorate recipients' institutions

The COVID-19 pandemic had varying effects across doctorate recipients in different types of institutions. Doctorate recipients from very high research institutions reported impacts on their research, immediate postgraduate employment or education plans, or plans about where to live in the year after graduation in higher proportions than doctorate recipients from high research institutions, who in turn reported those three impacts in larger proportions than those in doctoral/professional institutions ([figure 30](#)). Doctorate recipients at very high and at high research institutions reported being similarly impacted regarding the timeline for completing their doctorate—over half indicated that their timeline was delayed, a higher proportion than their counterparts at doctoral/professional institutions (46%).

**Figure 30**

COVID-19 pandemic impacts among S&E doctorate recipients, by 2018 Carnegie Classification of doctorate institution: 2022



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of S&E doctorate recipients who responded to the COVID-19 impact questions (39,315 respondents). Impact areas shown are those with the largest differences by 2018 Carnegie Classification.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

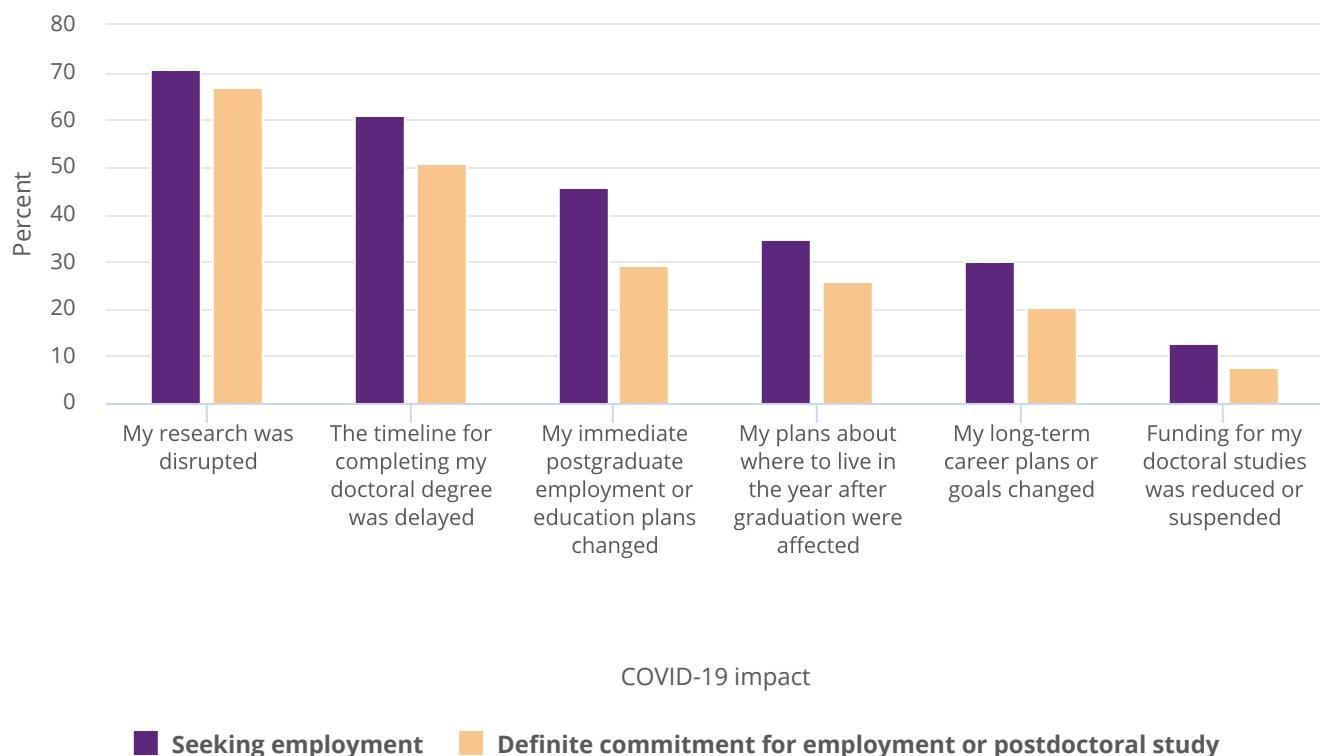
## COVID-19 pandemic impacts on S&E doctorate recipients' postgraduation employment status and plans

### Postgraduation status

More S&E doctorate recipients who were still seeking employment at graduation reported being affected by the pandemic compared with their counterparts who already had a definite commitment ([figure 31](#)). Specifically, larger proportions of those who were still seeking employment at graduation than of those with definite commitments reported change in their immediate or long-term postgraduation employment or education plans, delay in their timeline until degree, and change in their plans about where to live in the year after graduation. In addition, S&E doctorate recipients who were still seeking employment also reported that their research had been disrupted in slightly larger proportions than those with definite commitments and that funding for their doctoral studies had been reduced or suspended as a result of the pandemic.

**Figure 31**

COVID-19 pandemic impacts among S&E doctorate recipients, by postgraduation employment status: 2022



**Note(s):**

Percentages are based on the number of S&E doctorate recipients who responded to the COVID-19 impact questions and reporting postgraduation status (39,606 respondents) and exclude respondents who indicated "other status," such as being enrolled in another full-time degree program, not planning to work or study, or other status. Seeking employment includes doctorate recipients negotiating an offer of employment with one or more specific organizations or seeking a position but currently have no offer of employment. Definite commitment refers to a doctorate recipient who is either returning to predoctoral employment or has signed a contract (or otherwise made a definite commitment) for employment or postdoctoral study in the coming year.

**Source(s):**

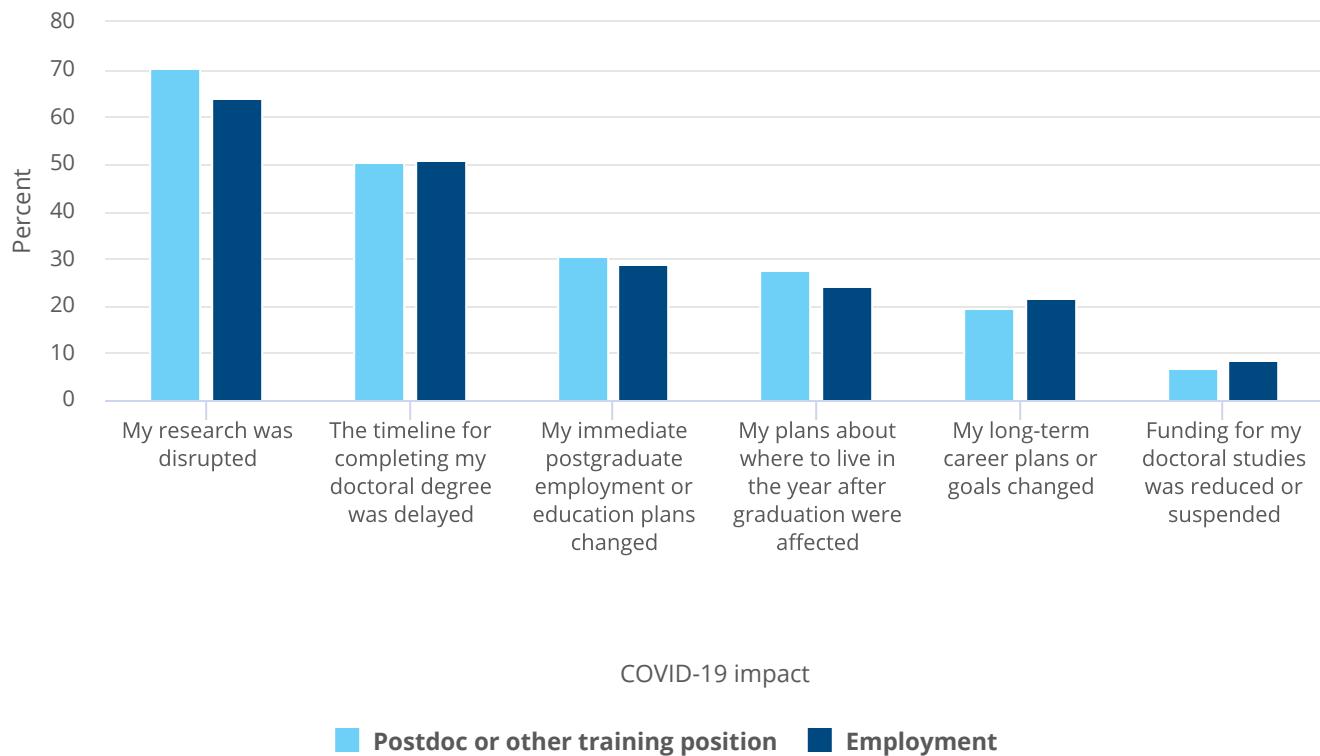
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

## Postgraduation employment plans

Among S&E doctorate recipients with definite commitments, larger proportions of those who had accepted postdocs or other training positions than of those who had accepted other employment indicated their research had been disrupted, their immediate plans changed, or their plans about where to live in the year after graduation had been affected ([figure 32](#)). However, these differences by postgraduation employment plans are less pronounced than in 2021.<sup>29</sup>

**Figure 32**

**COVID-19 pandemic impacts among S&E doctorate recipients, by type of definite commitment: 2022**



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of S&E doctorate recipients who responded to the COVID-19 impact questions and had definite commitments (30,065 respondents). Postdoc or other training position includes: postdoc fellowship (including postdoc research associateships), traineeships, internships or clinical residencies, and other training. Employment includes military service, other employment, and unspecified employment (including missing). Impact areas shown are those with the largest differences by type of definite commitment.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

## COVID-19 pandemic impacts on S&E doctorate recipients by demographics

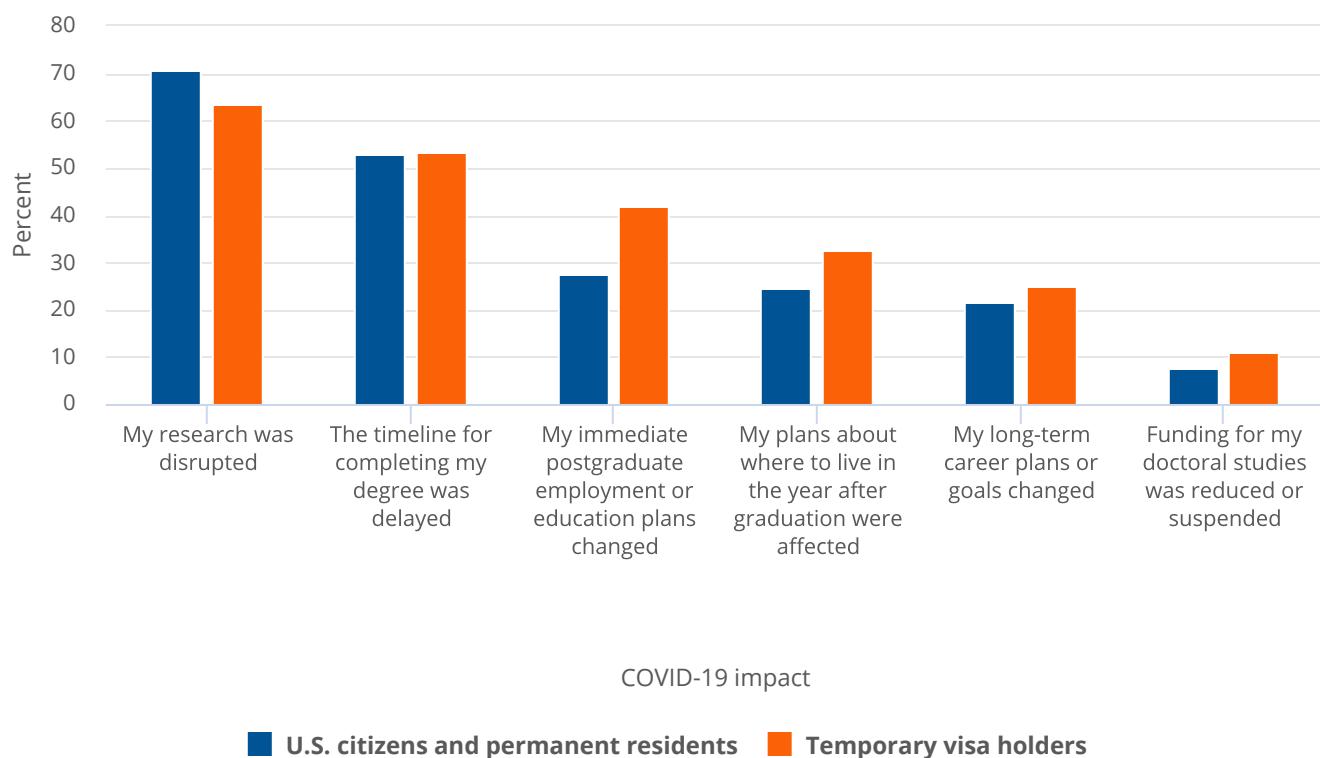
Overall, the impacts of the COVID-19 pandemic were more salient when looking at differences by field, type of institution, and postgraduation employment status and plans than by doctorate recipients' demographics. However, there were two notable differences by demographics across citizenship status and dependent status.

## Citizenship

S&E doctorate recipients who were U.S. citizens or permanent residents reported disruptions to their research more frequently than their temporary visa holder counterparts ([figure 33](#)). Conversely, larger proportions of doctorate recipients on temporary visas than of U.S. citizens and permanent residents were affected in all other impact areas. Among S&E doctorate recipients whose research was disrupted, a larger proportion of U.S. citizens and permanent residents than of temporary visa holders said they had limited or no access to resources and changed their research plans ([table E](#)). Among S&E doctorate recipients who said their immediate postgraduate employment or education plans had changed, larger proportions of temporary visa holders than of U.S. citizens and permanent residents said they had limited job opportunities and had to accept a less desirable job.

**Figure 33**

**COVID-19 pandemic impacts among S&E doctorate recipients, by citizenship status: 2022**



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of U.S. citizen and permanent resident (24,892 respondents) and temporary visa holder (15,960 respondents) S&E doctorate recipients who responded to the COVID-19 impact questions. Impact areas shown are those with the largest differences by citizenship status.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

**Table E**

**S&E doctorate recipients who said their research was disrupted or immediate postgraduate employment or education plans changed as a result of the COVID-19 pandemic, by type of disruption and citizenship status: 2022**

(Number and percent)

Type of disruption	U.S. citizens and permanent residents	Temporary visa holders
My research was disrupted (number)	17,591	10,132
Limited or no access to resources (%)	82.7	80.5
Changed my research plan (%)	68.2	58.3
Disrupted in other ways (%)	16.3	13.3
My immediate postgraduate employment or education plans changed (number)	6,836	6,671
Limited job opportunities (%)	69.4	81.2
Had to accept a less-desirable job (%)	31.8	35.9
Changed plans in other ways (%)	26.2	14.1

S&E = science and engineering.

**Note(s):**

Multiple responses allowed.

**Source(s):**

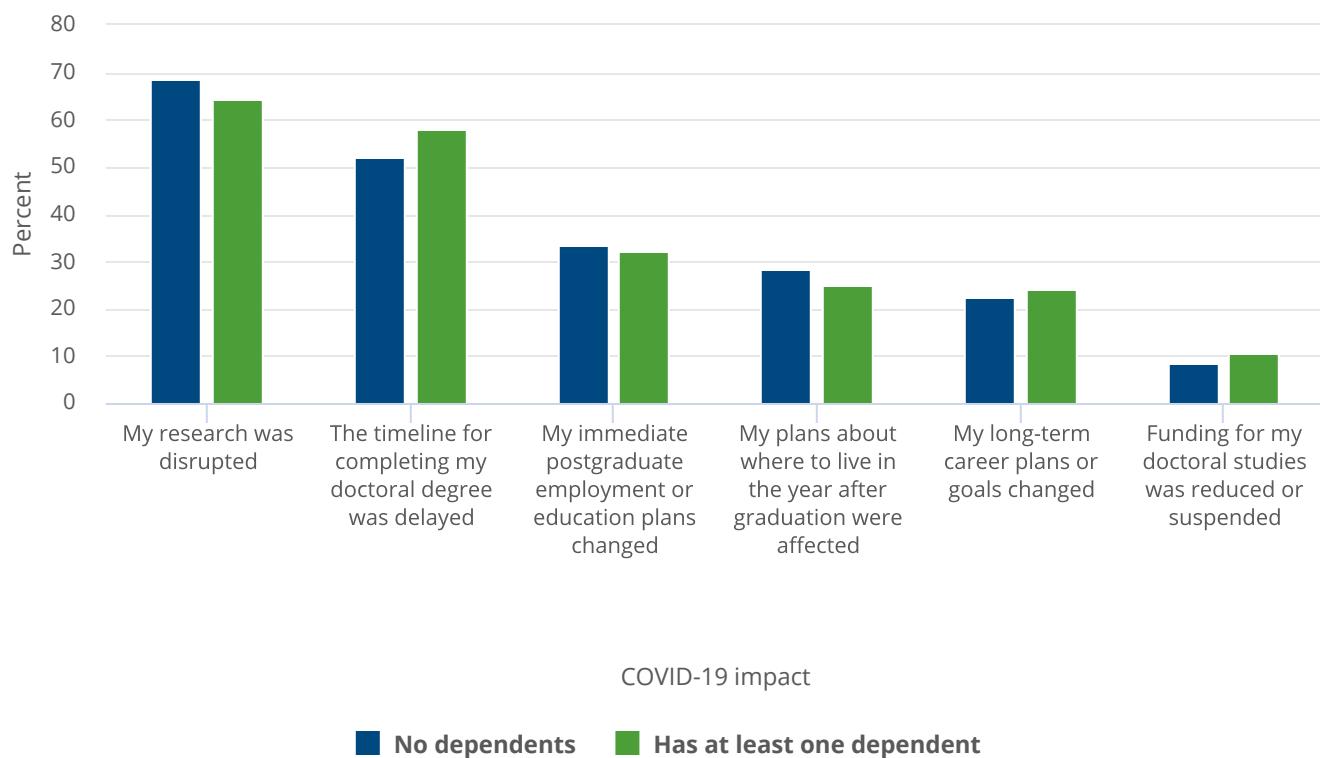
National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

## Dependent status

Larger proportions of S&E doctorate recipients with at least one dependent than of those with no dependents reported that the COVID-19 pandemic delayed their timeline for completing their doctorate, changed their long-term career plans or goals, or caused a reduction or suspension in their funding ([figure 34](#)). Conversely, S&E doctorate recipients with no dependents indicated more frequently that their research was disrupted, that their immediate postgraduate employment or education plans changed, or that their plans about where to live were affected.

**Figure 34**

**COVID-19 pandemic impacts among S&E doctorate recipients, by dependent status: 2022**



S&E = science and engineering.

**Note(s):**

Percentages are based on the number of S&E doctorate recipients who responded to the COVID-19 impact questions (40,670 respondents). Impact areas shown are those with the largest differences by dependent status.

**Source(s):**

National Center for Science and Engineering Statistics, Survey of Earned Doctorates, 2022.

## Glossary

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**Basic annual salary.** Annual salary for a principal job of doctorate recipients with definite commitments, not including bonuses or additional compensation for summertime teaching or research.

**Cumulative debt.** The amount of debt, incurred both at the undergraduate level and the graduate level, owed by a doctorate recipient at the time the doctorate is awarded.

**Definite commitment.** A commitment, through a contract or other method, by doctorate recipients to accept employment or a postdoctoral study (postdoc) position in the coming year or to return to predoctoral employment.

**Definite non-postdoc employment commitment.** A definite commitment by doctorate recipients for employment (excluding postdocs) in the coming year.

**Expected stay rates.** Proportion of temporary visa holder doctorate recipients with definite commitments at graduation in the United States among temporary visa holders with definite commitments.

**Field.** Beginning in 2021, the SED collects over 1,600 fields for reporting of field of research doctorate, using a modified version of the 2020 Classification of Instructional Programs (CIP)—compared to 334 fields collected in 2020 and previous years. The SED-CIP codes were then aggregated into 305 detailed field codes nested into 66 major fields and 16 broad fields and are used to report field of doctorate data in the detailed data tables.

To facilitate trend data comparisons, historical field data were estimated based on a crosswalk of the new 2021 SED-CIP codes to the SED field of study codes used in prior survey years. The trend data reported in this report uses 14 trend broad fields (excluding multidisciplinary/ interdisciplinary sciences)—10 S&E fields: agricultural sciences and natural resources; biological and biomedical sciences; computer and information sciences; engineering; geosciences, atmospheric, and ocean sciences; health sciences; mathematics and statistics; physical sciences; psychology; social sciences; and 4 non-S&E fields: business, education, humanities and arts; and other non-S&E fields. (See “Field” under “Time series data changes” in the [“Data source” section](#).)

**Graduate debt.** The amount of debt from graduate-level education owed by a doctorate recipient at the time the doctorate is awarded.

**NCSES.** National Center for Science and Engineering Statistics.

**Non-S&E.** Non-science and engineering: Non-S&E broad fields used in trend data discussions in the first four recurring report themes are based on historical fields that included business; education; humanities and arts (combined); and other non-S&E fields, such as communications. The new SED taxonomy broad fields for 2021 report humanities and visual and performing arts fields separately, which is reflected in the special focus section on COVID-19 pandemic impacts.

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

**Postdoctoral (postdoc) position.** A temporary position primarily for gaining additional education and training in research, usually awarded in academe, industry, government, or a nonprofit organization.

**Race and ethnicity.** Doctorate recipients who report Hispanic or Latino heritage, regardless of racial designation, are counted as Hispanic or Latino, and 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 those indicating Native Hawaiian or Other Pacific Islander, who are included in “other race or race not reported.”

**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 SED. Professional doctoral degrees, such as the MD, DDS, JD, and PsyD, are not covered by the survey.

**S&E.** Science and engineering: S&E broad fields used in trend data discussions are based on 10 fields that include agricultural sciences and natural resources; biological and biomedical sciences; computer and information sciences; engineering; geosciences, atmospheric, and ocean sciences; health sciences; mathematics and statistics; physical sciences; psychology; and social sciences. The broad fields used in trend data do not include multidisciplinary/interdisciplinary sciences, which is new in the SED field of study taxonomy in 2021.

**Sources of financial support.** Sources of financial support are grouped into the following five categories: fellowships (includes scholarships and dissertation 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 time elapsed from the start of any graduate school program to completion of the doctoral degree.

**Underrepresented minority.** Groups that 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.<sup>30</sup>

## Data source

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The Survey of Earned Doctorates (SED) is the sole data source for *Doctorate Recipients from U.S. Universities: 2022*. The principal elements of the 2022 SED data collection are described in the sections that follow. More detailed information, including “Technical Notes” and related technical tables, are available at <https://nces.nsf.gov/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 2022 SED recognized 18 distinct types of research doctorates. In 2022, 98.6% of research doctorate recipients earned a PhD.

The population eligible for the 2022 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 2021 to 30 June 2022.

**Survey universe.** The total universe consisted of 57,596 persons in 457 institutions that conferred research doctorates in academic year 2022.

**Data collection.** Institutional coordinators at each doctorate-awarding institution distributed the SED Web survey link to individuals receiving a research doctorate. The self-administered Web survey is the primary mode of SED completion. Nonrespondents were contacted by e-mail and mail to complete the Web survey. If the series of follow-up e-mails and mailings is unsuccessful, the survey contractor attempts to reach nonrespondents to complete an abbreviated survey by computer-assisted telephone interviewing. RTI International served as the 2022 SED data collection contractor on behalf of NCSES.

**Survey response rates.** In 2022, 91.6% of research doctorate recipients completed the survey. 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. The survey response rates for 1970–2022 and the item response rates for 2013–22 are provided in table A-2 and table A-3 of the survey’s 2022 “Technical Notes.”

### Time series data changes.

- *EdD program reclassification.* 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. [Figure 8](#) in this report shows the impact of the decline in the number of doctoral degrees awarded in education from 2009 to 2011. Readers should note that the declines from 2009 to 2010 and from 2010 to 2011 are at least partly attributable to the EdD reclassification.<sup>31</sup>
- *Field.* Beginning in 2021, field of doctorate data are collected using a modified version of the 2020 Classification of Instructional Programs (CIP) codes and reported using a new SED-specific taxonomy (table A-4). For more information about CIP codes, please see <https://nces.ed.gov/ipeds/cipcode/>. Adjustments to the 2020 CIP for the SED data collection (SED-CIP) included, among other changes, the addition of over 50 fields of study codes collected in the SED but not covered in the 2020 CIP. The SED-CIP now collects over 1,600 fields for field of study reporting, compared to the 334 field codes collected in 2020 SED and prior years. The SED-CIP codes collected are then aggregated into 305 detailed fields nested under 66 major fields and 16 broad fields, which are used for reporting in the 2022 detailed data tables. This field structure is aligned with the NCSES Taxonomy of Disciplines (TOD) to facilitate comparison with other NCSES surveys as well as with the Integrated Postsecondary Education

Data System (IPEDS) Completions survey. A crosswalk of the SED-CIP codes to new SED broad, major, and detailed fields of study is shown in table A-5 of the 2022 “Technical Notes.” To facilitate the trend data comparison with prior years, additional crosswalks were created as follows:

- A crosswalk of the SED-CIP codes to the SED historical broad, major, and fine fields of study used to construct the comparable 2021 and 2022 data, as shown in table A-6 of the 2022 “Technical Notes.”
- A crosswalk of the aggregated broad fields used in the 2002–22 trends covered in this report to the historical broad fields used in the detailed tables, as shown in table B-2. The set of broad fields used for trend data across all years were derived to be similar to the new SED-CIP broad fields and they offer data that are generally comparable across years.

**Data license.** Microdata from the Doctorate Records File (cumulative SED data file) may be obtained through a restricted-use data license. (See <https://ncses.nsf.gov/about/licensing>.)

## Notes

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- 1** The calculation of these proportions excluded doctorate recipients who did not report citizenship.
- 2** The calculation of these proportions excluded respondents who did not report sex or citizenship.
- 3** The calculation of these proportions excluded respondents who did not report sex or citizenship.
- 4** For additional data on the race and ethnicity of doctorate recipients, see SED 2022 related detailed table 1-11. Race categories exclude Hispanic origin; Hispanic may be any race.
- 5** In 2002, there were 16,608 S&E U.S. citizen and permanent resident doctorate recipients; in 2022, there were 26,408 S&E U.S. citizen and permanent resident doctorate recipients.
- 6** Beginning in 2021, field of doctorate data are collected using a modified version of the 2020 Classification of Instructional Programs (CIP) codes and reported using a new SED-specific taxonomy (table A-4). For more details of data comparability, see the 2022 “Technical Notes” and the [SED 2021 Taxonomy Changes Working Paper](#).
- 7** The drop in the number of doctorate recipients in the field of education between 2009 and 2011 is at least partly attributable to the reclassification of Doctor of Education (EdD) programs. For details, see “Time series data changes” in the “[Data source](#)” section.
- 8** For details about changes in the field of education between 2009 and 2011, see “Time series data changes” in the “[Data source](#)” section.
- 9** For additional data by citizenship status of doctorate recipients, see SED 2022 related detailed table 1-6.
- 10** In 2022, the count of White doctorate recipients in each field is as follows: biological and biomedical sciences (4,442); engineering (2,875); psychology (2,153); social sciences (2,061); physical sciences (2,241); health sciences (1,250); mathematics and statistics (661); multidisciplinary/interdisciplinary sciences (513); computer and information sciences (473); agricultural sciences and natural resources (563); geosciences, atmospheric, and ocean sciences (569); non-S&E fields (5,519).
- 11** For details on non-S&E fields, see SED 2022 related detailed table 1-11.
- 12** For additional data on the field of education, humanities and arts, and other non-S&E fields, see SED 2022 related detailed table 1-4.
- 13** For detailed data by field, see SED 2022 related detailed table 1-5.
- 14** For a detailed discussion on other aspects of education-related debt, see “[Education-Related Debt](#)” in National Center for Science and Engineering Statistics (NCSES). 2019. *Doctorate Recipients from U.S. Universities 2018*. NSF 20-301. Available at <https://ncses.nsf.gov/pubs/nsf20301/report>.
- 15** For more data on the primary sources of financial support of doctorate recipients by field, see [figure 16](#) in this report and SED 2022 related detailed table 4-1.
- 16** This statement refers to debt-holding doctorate recipients with definite non-postdoc employment commitments in the United States.
- 17** Within non-S&E, education is the field with the longest median time to degree (12.3 years from graduate school entry to doctorate in 2022). For more data, see SED 2022 related detailed table 3-6.

- 18** For details on the growth of the S&E workforce, see National Science Board. 2021. The STEM Labor Force of Today: Scientists, Engineers and Skilled Technical Workers. *Science and Engineering Indicators 2022*. NSB-2021-2. Available at <https://ncses.nsf.gov/pubs/nsb20212>.
- 19** For data on doctorate recipients with definite postgraduation employment commitments in academia, see SED 2022 related detailed table 2-6.
- 20** For data on doctorate recipients with definite postgraduation employment commitments industry or business, see SED 2022 related detailed table 2-6.
- 21** Industry includes all nonacademic sectors, including self-employment, private for-profit and private nonprofit, and government.
- 22** Special tabulation from the 2022 Survey of Earned Doctorates.
- 23** To measure the impacts of the COVID-19 pandemic on new doctorate recipients' graduate experiences and postgraduation plans, a set of questions was designed, tested, and included as a new module starting with the 2021 Survey of Earned Doctorates (SED). See the "Technical Notes" for details about slight changes in the wording of the COVID-19 module questions between 2021 and 2022.
- 24** Doctorate recipients were allowed to provide multiple responses as to how their research was disrupted.
- 25** Doctorate recipients were allowed to provide multiple responses as to how their postgraduation employment or education plans changed.
- 26** NCSES, special tabulation (2023) of the 2022 SED. Doctorate recipients were allowed to provide multiple responses as to how their long-term career plans or goals changed.
- 27** NCSES, special tabulation (2023) of the 2022 SED.
- 28** NCSES, special tabulations (2022) of the 2022 SED.
- 29** For details of COVID-19 pandemic impacts on doctorate recipients in 2021, see the previous edition at <https://ncses.nsf.gov/pubs/nsf23300/report/special-focus-covid-19-pandemic-impacts-on-doctorate-recipients>.
- 30** For detailed data on underrepresented minorities, see National Center for Science and Engineering Statistics. 2023. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2021*. NSF 23-315. Alexandria, VA: National Science Foundation. Available at <https://ncses.nsf.gov/pubs/nsf23315/>.
- 31** For more details on the declines in education between 2009 and 2011, see SED 2022 related detailed table 1-3 and **SED 2018** table 13.

## Acknowledgments and citation

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