



National Center for Science and
Engineering Statistics

InfoBrief

U.S. Residing Doctoral Scientists and Engineers Report Modest Professional Impacts from the Coronavirus Pandemic: Findings from the 2021 Survey of Doctorate Recipients

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In 2021, an estimated 1,185,750 individuals worldwide held a research doctoral degree in a science, engineering, or health (SEH) field earned at a U.S. academic institution, an increase of 36,950 (3.2%) doctorate recipients since 2019. In this group, 1,023,650 (86.3%) were residing in the United States, and 162,100 were living abroad. These numbers represent a growth of 1.5% since 2019 for those residing in the United States but an increase of 15.9% for those living outside of the United States.

The coronavirus pandemic has had a profound effect on the education, employment, and professional activities of many individuals worldwide since its emergence in early 2020. Although the pandemic has introduced physical, emotional, and economic difficulties around the globe, these pandemic-related hardships were not experienced equally across groups with differing demographic characteristics such as education level. For example, when compared to the college-educated population, with a few exceptions the magnitude of COVID-related employment disruptions for U.S.-trained doctorate recipients can be characterized as modest. In particular, among U.S.-trained doctoral scientists and engineers who were residing in the United States, the proportion who were unemployed was estimated at 1.4% in 2019 and at 1.6% in 2021. Unlike the modest change in unemployment within the highly skilled doctoral population, U.S. residing college graduates experienced an unemployment rate increase from 2.5% in 2019 to 4.5% in 2021.¹ For the overall U.S. population, the unemployment rate increased from 3.8% in 2019 to 6.2% in 2021.²

These findings on the U.S.-trained SEH doctorate holders are from the Survey of Doctorate Recipients (SDR)—a unique source of information about the educational background, occupational achievements, and career movements of U.S.-trained scientists and engineers since 1973. The SDR, along with several other surveys conducted by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation, provides data on the characteristics and employment activities of individuals with U.S.-earned SEH doctorate degrees worldwide. The latest wave of the SDR was conducted in 2021 and included new questions related to the coronavirus pandemic, providing an opportunity to assess the pandemic's effects on U.S.-trained SEH doctorate holders. This InfoBrief examines how the pandemic affected the employment status, salary, and work conditions of U.S.-trained SEH doctorate holders residing in the United States.

Impact of Coronavirus Pandemic on Employment Status of U.S.-Trained SEH Doctorate Holders

The number of U.S.-trained SEH doctorate holders working and residing in the United States was 872,100 in 2021, an increase of 14,900 from 2019 (table 1). This corresponds to a virtually unchanged overall employed rate of 85.0% in 2019 and 85.2% in 2021. Among those not working, the number unemployed rose from 14,100 to 16,650, the number not employed or not seeking work rose from 17,650 to 20,150, and the number retired fell from 120,000 to 114,750. Overall, no substantial shifts were observed in the employment status composition of U.S.-trained SEH doctorate holders residing in the United States between 2019 and 2021. Going back to 2015, the overall employment distribution of U.S.-trained SEH doctorate holders residing in the United States has remained remarkably stable (figure 1), with the proportions employed full time or part time, retired, unemployed, or not employed or not seeking work essentially remaining in a narrow range over the last four cycles of the SDR.

Table 1

Employment status of U.S.-trained doctoral scientists and engineers: 2019 and 2021

(Number and percent)

Employment status	U.S. residing				Non-U.S. residing			
	2019		2021		2019		2021	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,008,950	100.0	1,023,650	100.0	139,850	100.0	162,100	100.00
Employed	857,200	85.0	872,100	85.2	126,050	90.1	145,250	89.6
Full time	763,350	75.7	779,600	76.2	113,400	81.1	128,100	79.0
Part time	93,900	9.3	92,500	9.0	12,650	9.0	17,150	10.6
Reported COVID-related reasons for working part time ^a	na	na	20,300	2.0	na	na	3,000	1.8
Unemployed ^b	14,100	1.4	16,650	1.6	1,950	1.4	3,200	2.0
Reported COVID-related reasons for not working ^c	na	na	6,750	0.7	na	na	1,050	0.6
Retired	120,000	11.9	114,750	11.2	9,900	7.1	10,750	6.6
Not employed or not seeking work ^d	17,650	1.7	20,150	2.0	2,000	1.4	2,900	1.8
Reported COVID-related reasons for not working ^c	na	na	3,600	0.4	na	na	150	0.1
Overall (employment status affected by COVID) ^e	na	na	30,700	3.0	na	na	4,200	2.6

na = not applicable.

^a COVID-related reasons for working part time include family responsibilities (COVID related), full-time job not available (COVID related), and hours reduced (COVID related).

^b Unemployed includes individuals who were not working during the survey reference week but had been seeking work in the prior 4 weeks or who were on layoff from their job.

^c COVID-related reasons for not working include on layoff from a job (COVID related) and family responsibilities (COVID related).

^d Not employed or not seeking work includes individuals who were not working during the survey reference week and had not been seeking work in the prior 4 weeks.

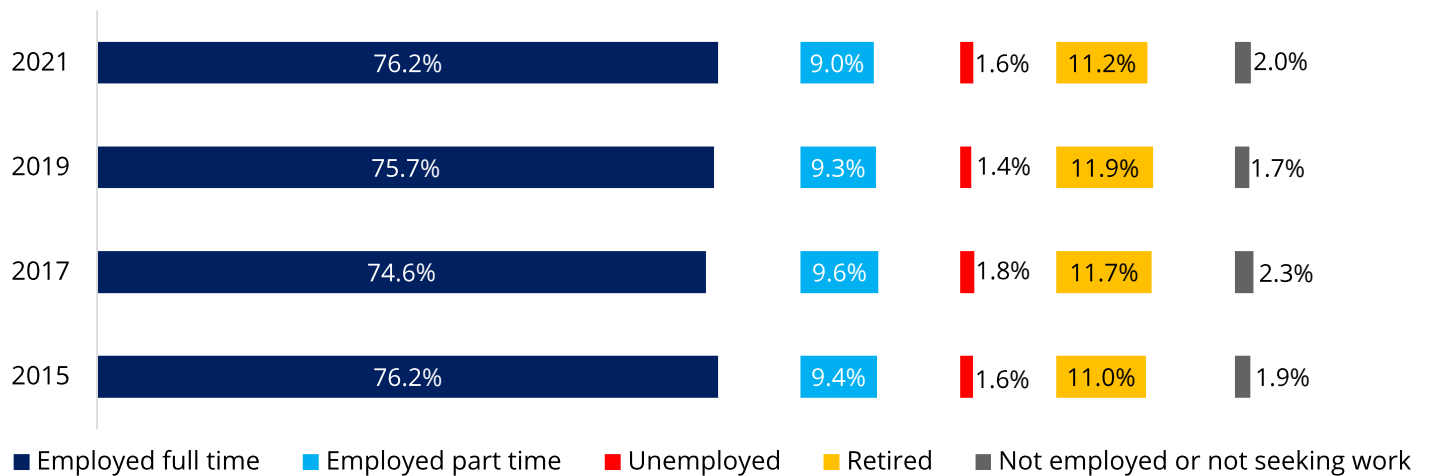
^e Employment status affected by COVID includes reported COVID-related reason for changing the job since 2019 among full-time employed, reported COVID-related reasons for working part time, reported COVID-related reasons for not working.

Note(s):

Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients.

Figure 1**Employment status of U.S. residing doctoral scientists and engineers: 2015–21****Note(s):**

Unemployed includes individuals who were not working during the survey reference week but had been seeking work in the prior 4 weeks or who were on layoff from their job. Not in the labor force includes individuals who were not working during the survey reference week and had not been seeking work in the prior 4 weeks because of family responsibilities, chronic illness, or other reasons. Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients.

As noted earlier, the number of U.S.-trained SEH doctorate holders residing outside of the United States increased by almost 16% since 2019. This increase was spread across all the employed and not employed categories, resulting in a mostly stable employment status composition between both years. The overall proportion that was employed was about 90% in both 2019 and 2021, approximately 5% higher than the corresponding proportion of those residing in the United States. This difference between the regions is mainly manifested in the larger proportion of full-time employed among those residing outside the United States.

Of the approximately 1 million U.S.-trained SEH doctorate holders residing in the United States, 30,700, or 3.0%, reported that their employment status was affected by the coronavirus pandemic: 20,300 who were working part time, 6,750 who were unemployed, and 3,600 who were not employed or not seeking work.

The number of U.S.-trained SEH doctorate holders residing outside the United States whose employment status was affected by the COVID pandemic was 4,200: 3,000 who were working part time, 1,050 who were unemployed, and 150 who were not employed or not seeking work. Overall, this corresponds to 2.6% of the U.S.-trained SEH doctorate holders residing outside of the United States whose employment status was affected by the COVID pandemic, a similar percentage (3.0%) as the one found for those residing in the United States.

Impact of Coronavirus Pandemic on Earned Income

Among U.S. residing doctoral scientists and engineers who were employed full time, 81.9% reported no change in their 2020 earned income³ due to the COVID pandemic, whereas 12.8% reported a decrease and 5.3% reported an increase related to the pandemic (table 2). The reported impact of COVID on earned income varied across sectors and employment status (figure 2).⁴ Interestingly, the fraction of full-time employed individuals reporting a decrease in earned income was

significantly lower (5.3%) in the government sector than in the education sector and in the business or industry sector (14.6% and 12.6%, respectively) (table 2). Those employed in the federal government were particularly unaffected, with only 1.7% reporting a decrease, whereas 30.6% of self-employed doctoral scientists and engineers reported decreased earned income due to the pandemic. Part-time employed workers experienced greater negative effects of the pandemic.

Table 2

Impact of COVID pandemic on 2020 earned income of U.S. residing employed doctoral scientists and engineers: by employment type and sector of employment

(Percent and dollars)

Employment type and sector of employment	Median earned income	Decreased		Increased		Not affected
		Percent	Income change (median) in dollars	Percent	Income change (median) in dollars	Percent
Employed full time	125,000	12.8	10,000	5.3	10,000	81.9
Educational institution ^a	100,000	14.6	5,000	3.4	5,000	82.0
4-year educational institution	100,000	14.9	5,000	3.1	5,000	82.0
Other educational institution	85,000	9.6	5,000	7.3	3,000	83.1
Government ^b	127,000	5.3	10,000	4.5	5,000	90.2
Federal government	134,000	1.7	11,000	3.9	5,000	94.4
State or local government	109,000	13.3	10,000	5.7	5,000	81.0
Business or industry ^c	153,000	12.6	19,000	7.3	14,000	80.1
Private, nonprofit	124,000	9.6	10,000	5.5	7,000	84.9
Private, for profit	161,000	12.1	19,000	7.2	14,000	80.6
Self-employed	115,000	30.6	25,000	14.7	21,000	54.7
Employed part time	65,000	25.6	15,000	6.1	10,000	68.3
Educational institution	60,000	16.6	10,000	4.3	5,000	79.1
4-year educational institution	66,000	15.3	10,000	4.3	S	80.4
Other educational institution	36,000	22.1	9,000	4.5	3,000	73.4
Government	75,000	18.1	17,000	4.1	16,000	77.7
Federal government	87,000	10.9	24,000	D	D	83.3
State or local government	64,000	22.8	15,000	3.0	S	74.2
Business or industry	68,000	30.5	18,000	7.1	11,000	62.5
Private, nonprofit	68,000	24.9	14,000	5.3	8,000	69.8
Private, for profit	79,000	28.4	19,000	7.0	15,000	64.6
Self-employed	55,000	34.0	18,000	7.5	9,000	58.4

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

^a Educational institution includes 4-year colleges or universities, medical schools (including university-affiliated hospitals or medical centers), university-affiliated research institutes, 2-year colleges, community colleges, technical institutes, precollege institutions, and other educational institutions.

^b Government includes U.S. federal, state, and local government and non-U.S. government at any level.

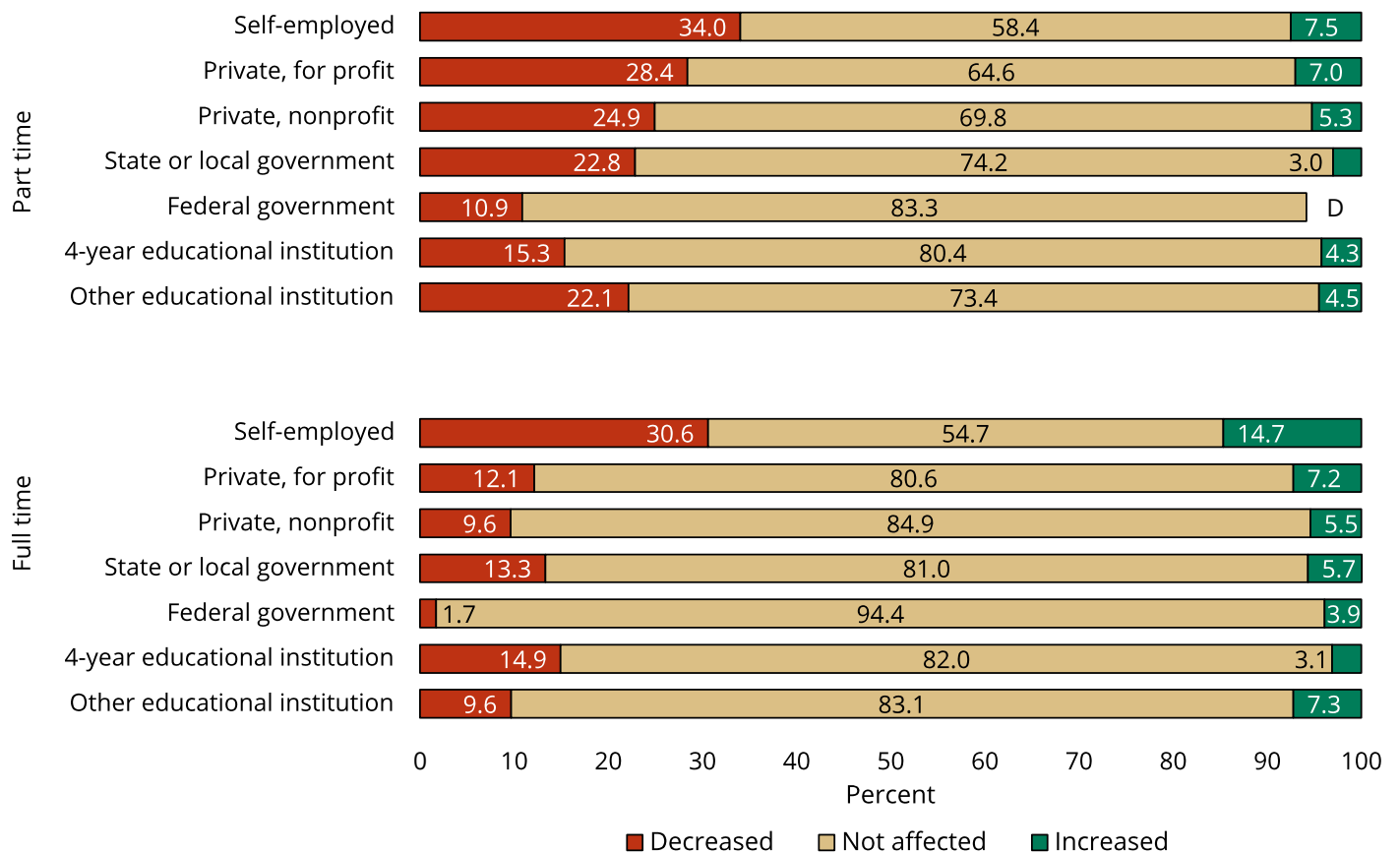
^c Business or industry includes private for profit, private not for profit, self-employed or business owners in incorporated or nonincorporated business, and employers not broken out separately.

Note(s):

Median earned income change estimates are rounded to nearest \$1,000. Percentages are rounded to the nearest 0.1%. Detail may not sum to total due to rounding. Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients: 2021.

Figure 2**Impact of COVID pandemic on 2020 earned income of U.S. residing employed doctoral scientists and engineers, by employment type and sector of employment**

D = suppressed to avoid disclosure of confidential information.

Note(s):

Other educational institution includes 2-year colleges, community colleges, or technical institutes, and other precollege institutions. Four-year educational institution includes 4-year colleges or universities, medical schools (including university-affiliated hospitals or medical centers), and university-affiliated research institutes. State or local government includes state and local government and non-U.S. government at any level. Private, for profit includes those self-employed in an incorporated business. Self-employed includes self-employed or business owner in a nonincorporated business. Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients: 2021.

Among U.S. residing doctoral scientists and engineers who were employed part time, 68.3% reported no change in their earnings due to COVID and 25.6% reported a decrease. Among all U.S. residing doctoral scientists and engineers, the proportion reporting a decrease in their earnings was significantly higher for part-time employed workers than for full-time employed workers in most sectors, although these proportions were approximately equal for those employed at 4-year educational institutions or for those who were self-employed. Self-employed doctoral scientists and engineers, both full time and part time, had the largest percentage reporting a decrease in income as a result of COVID, compared with all of the other employment sectors.

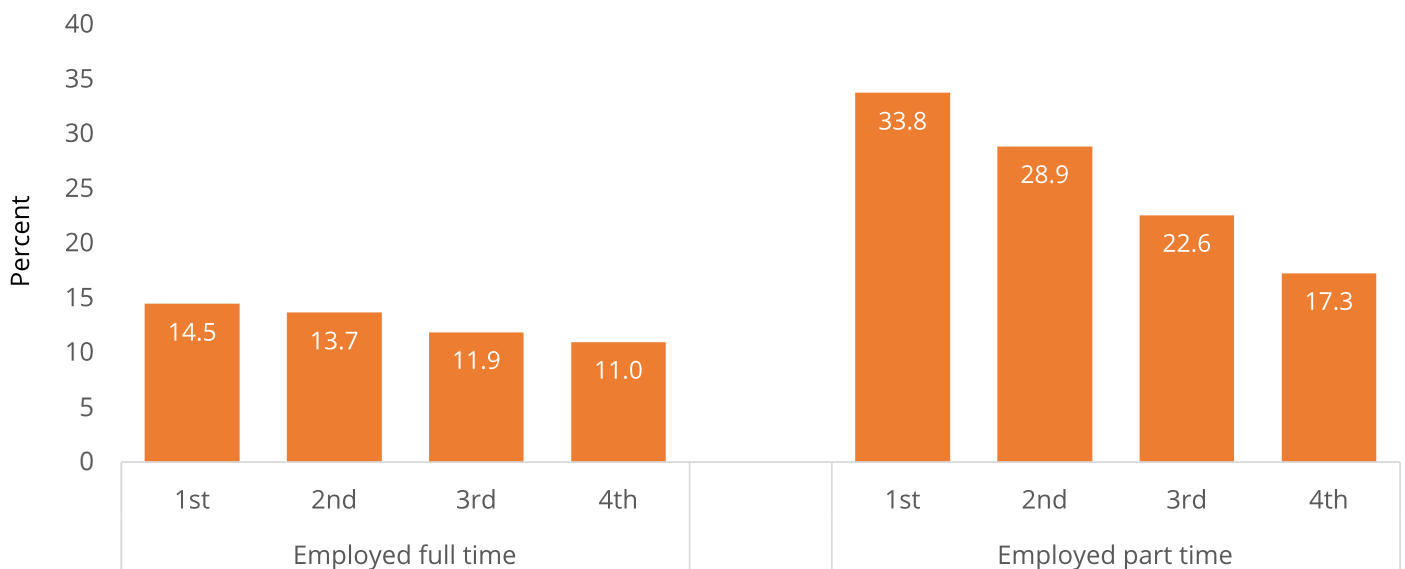
In addition to the proportions of U.S. residing doctoral scientists and engineers reporting that their earnings were affected by the pandemic, it is also possible to look at the magnitude of the effects on earnings ([table 2](#)). The median earned income decrease in 2020 due to COVID was \$10,000 for full-time employed individuals and \$15,000 for part-time employed individuals. The relative decrease was much larger for the latter group, because the median earnings for those who were employed part time was \$65,000, compared to \$125,000 for those employed full time.

The magnitude that the earnings decreased for those affected varied significantly between employment sectors. Among full-time workers who were negatively affected, the median decrease was \$5,000 in the education sector, \$10,000 in government, and \$19,000 in business or industry. Among the business sectors, the self-employed reported the largest negative median decrease (\$25,000), followed by the private for-profit sector (\$19,000), and the private nonprofit sector, which reported a median decrease similar to the one found in the government sectors. Among part-time workers who were negatively affected, the difference between sectors was not as large as that seen among full-time workers, with a median decrease of \$10,000 in the education sector and \$17,000 and \$18,000 in the government and business sectors, respectively.

When comparing the median earnings of those who experienced COVID-related decreases in earnings with those whose earnings remained unchanged or increased, those whose income decreased as a result of COVID also had a lower income to begin with. This was found across all sectors and employment types (part time or full time). The only exception to this was for full-time workers in the education sector. The higher effect of the pandemic on those with relatively lower earnings is further confirmed when looking at the fraction of individuals whose earnings decreased, by earnings quartile among those employed part time and full time ([figure 3](#)). Among those employed full time, 14.5% of those in the first (lowest) quartile of earnings experienced a COVID-related decrease. This percentage decreased to 11.0% in the fourth (highest) quartile of earnings. Among part-time employed individuals, this trend is even more pronounced, with 33.8% of those in the lowest earnings quartile experiencing a COVID-related earning decrease, compared with 17.3% in the highest earning quartile.

Figure 3

Decrease in 2020 earned income of U.S. residing doctoral scientists and engineers due to COVID pandemic, by earned income quartiles and employment type



Note(s):

Percentages are based on self-reported earned income affected by the coronavirus pandemic. The 1st earned income quartile includes the quarter of population reporting lowest earned income. Residence location is based on reported living location on 1 February 2021.

Source(s):

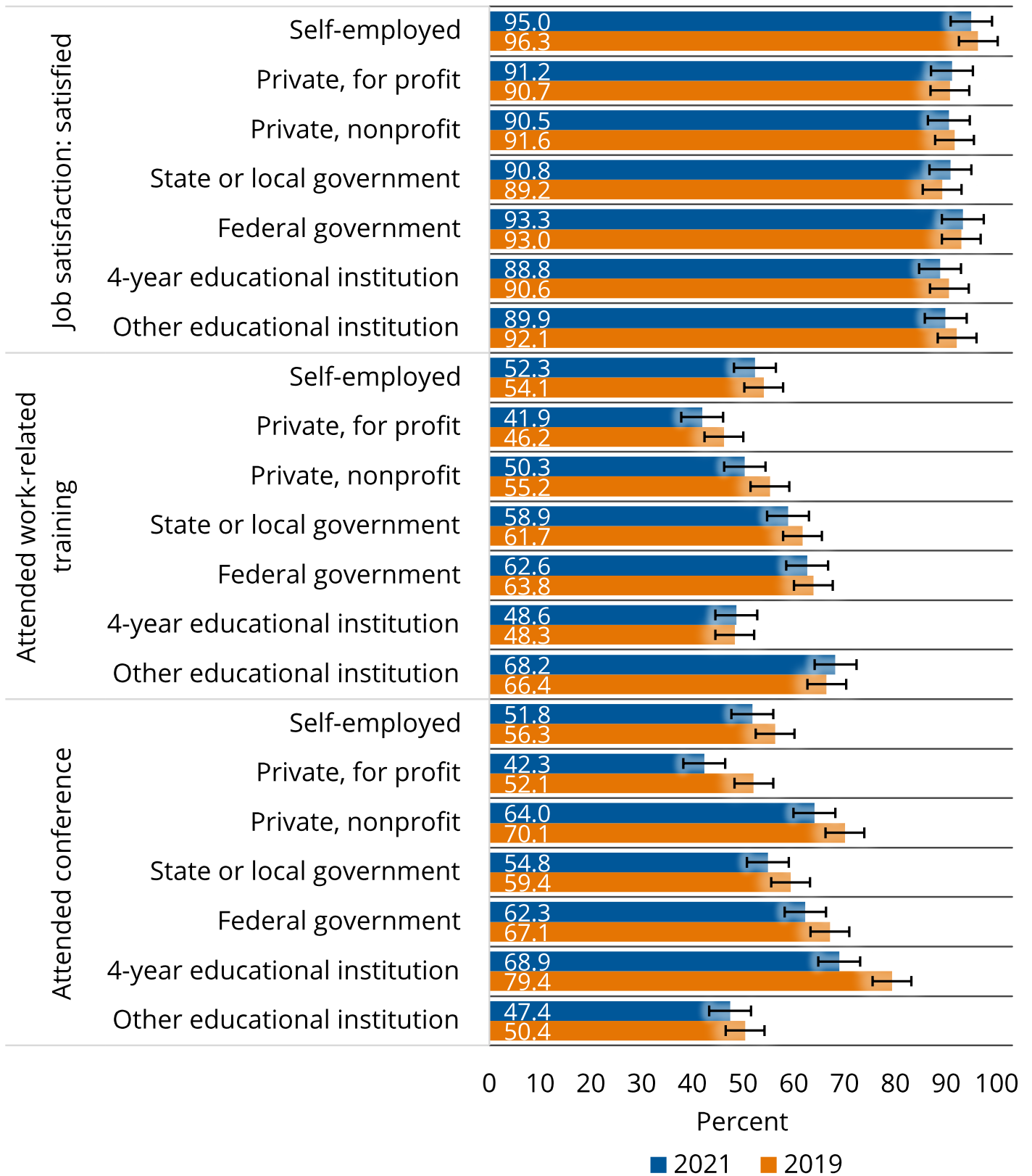
National Center for Science and Engineering Statistics, Survey of Doctorate Recipients: 2021.

Responses to COVID among U.S. Full-Time Employed

Despite the COVID pandemic, the degree of job satisfaction among full-time employed U.S.-trained SEH doctorate holders residing in the United States remained high in all sectors of employment, with 88.8%–95.0% rating themselves as very or somewhat satisfied with their principal job⁵ in 2021, compared with 89.2%–96.3% in 2019 ([figure 4](#)). Only very small differences are observable by sector, either in the level of job satisfaction or in the change from 2019 to 2021.

Figure 4

Job satisfaction and professional development among full-time employed U.S. residing doctoral scientists and engineers: 2019 and 2021



Note(s):

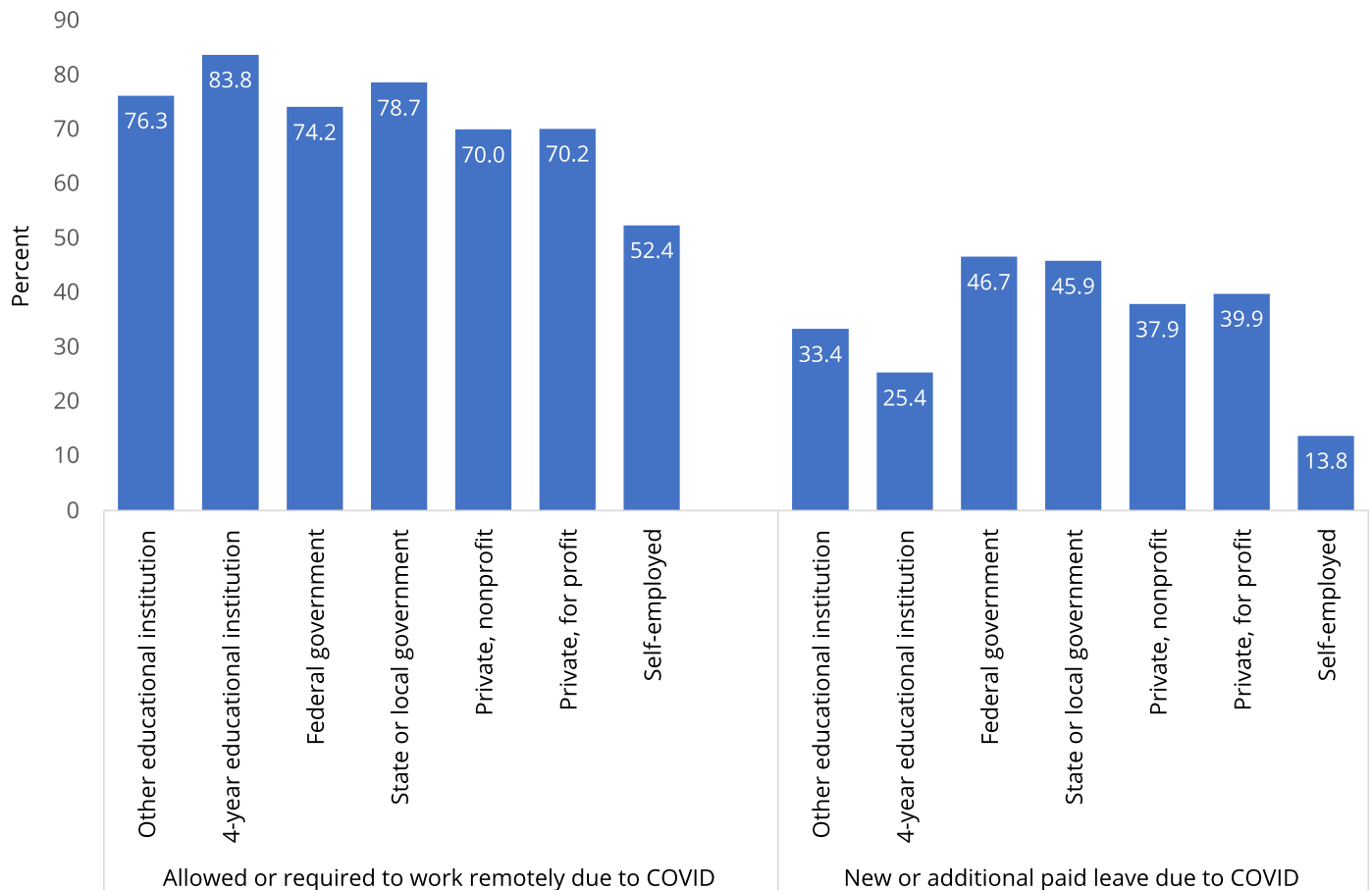
Other educational institution includes 2-year colleges, community colleges, or technical institutes, and other precollege institutions. Four-year educational institution includes 4-year colleges or universities, medical schools (including university-affiliated hospitals or medical centers), and university-affiliated research institutes. State or local government includes state and local government and non-U.S. government at any level. Private, for profit includes those self-employed in an incorporated business. Self-employed includes self-employed or business owner in a nonincorporated business. Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients: 2021.

The proportion of individuals working full time who attended work-related training decreased slightly in 2021 from 2019 for both the nonprofit and for-profit private sectors (from 55.2% to 50.3% for the nonprofit sector and from 46.2% to 41.9% for the for-profit sector). However, the proportions of those who attended conferences decreased more sharply, with the largest decrease seen among those employed in the 4-year educational sector (from 79.4% to 68.9%) and in the private for-profit sector (from 52.1% to 42.3%). Notable differences were seen between employment sectors in those activities. In the 4-year educational sector, there was virtually no change in work-related training (just below 50% in 2019 and 2021) but a large decrease in conference attendance. In contrast, the private nonprofit and for-profit sectors exhibited decreases in both activities between 2019 and 2021.

In response to the COVID pandemic, many employers in the United States instituted new policies, including allowing or requiring employees to work remotely and providing new or additional paid leave. Overall, 76.0% of full-time employed U.S.-trained SEH doctorate holders residing in the United States reported being allowed or required to work remotely due to the COVID pandemic.⁶ This fraction varied across sectors, ranging from 52.4% in the self-employed sector to 83.8% in the 4-year educational sector (figure 5). New or additional paid leave was provided to 33.7% of full-time employed U.S.-trained SEH doctorate holders residing in the United States, with large differences by sectors: 13.8% in self-employed, 25.4% in 4-year educational institution, and 46.7% in federal government.

Figure 5**Job benefits in response to COVID pandemic among full-time employed U.S. residing doctoral scientists and engineers: 2021****Note(s):**

Other educational institution includes 2-year colleges, community colleges, or technical institutes, and other precollege institutions. Four-year educational institution includes 4-year colleges or universities, medical schools (including university-affiliated hospitals or medical centers), and university-affiliated research institutes. State or local government includes state and local government and non-U.S. government at any level. Private, for profit includes those self-employed in an incorporated business. Self-employed includes self-employed or business owner in a nonincorporated business. Residence location is based on reported living location on 1 February 2021.

Source(s):

National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2021.

Data Sources, Limitations, and Availability

Data are from the 2021 SDR, which collects data on individuals who earned research doctoral degrees in SEH fields from U.S. institutions. The target population of the SDR consists of all U.S.-trained SEH doctoral graduates who were younger than 76 years of age and not institutionalized or terminally ill on 1 February 2021. To provide context, many comparisons with results from the prior cycles of SDR are also included. The SDR has been conducted since 1973 and is sponsored by NCSES and by the National Institutes of Health. The estimates in this InfoBrief are based on responses from a sample of the population and may differ from actual values because of sampling variability. As a result, apparent differences between the estimates for two or more groups may not be statistically significant. All comparative statements in this

report have undergone statistical testing and are significant at the 90% confidence level unless noted otherwise. In addition, the estimates presented are rounded to the nearest 50 (\$1,000 for salaries), although percentage calculations are based on unrounded estimates. More information on the SDR can be found at (<https://www.nsf.gov/statistics/srvydoctoratework/>).

Notes

- 1 The unemployment rates for U.S. residing college graduates were derived from the National Survey of College Graduates (NSCG) conducted by the National Center for Science and Engineering Statistics. The NSCG target population includes individuals who earned a bachelor's degree or higher and are younger than 76 years.
- 2 The unemployment rates for the overall U.S. population ages 16 years and older were derived from the Current Population Survey (CPS) conducted by the Bureau of Labor Statistics. The estimates presented are the unemployment rates as of February 2019 and February 2021, respectively. These months were chosen to align with the SDR and NSCG reference dates. CPS estimates were derived from <https://data.bls.gov/timeseries/LNS1400000> on 25 October 2022.
- 3 The SDR collects data on total earned income counting all jobs held in the calendar year prior to the survey reference period.
- 4 Although the reported earnings were for the 2020 calendar year, the full-time and part-time employment status was for the reference week of 1 February 2021.
- 5 Job satisfaction was reported on a 4-point scale, with categories "very satisfied," "somewhat satisfied," "somewhat dissatisfied," and "very dissatisfied."
- 6 Among those for whom working remotely made sense and who were not otherwise allowed or required to work remotely.

Suggested Citation

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