



National Center for Science and
Engineering Statistics

InfoBrief

Universities Report Growth in U.S. Citizen and Permanent Resident Enrollment along with Declines in Enrollment of Temporary Visa Holders at Master's and Doctoral Levels Due to the COVID-19 Pandemic

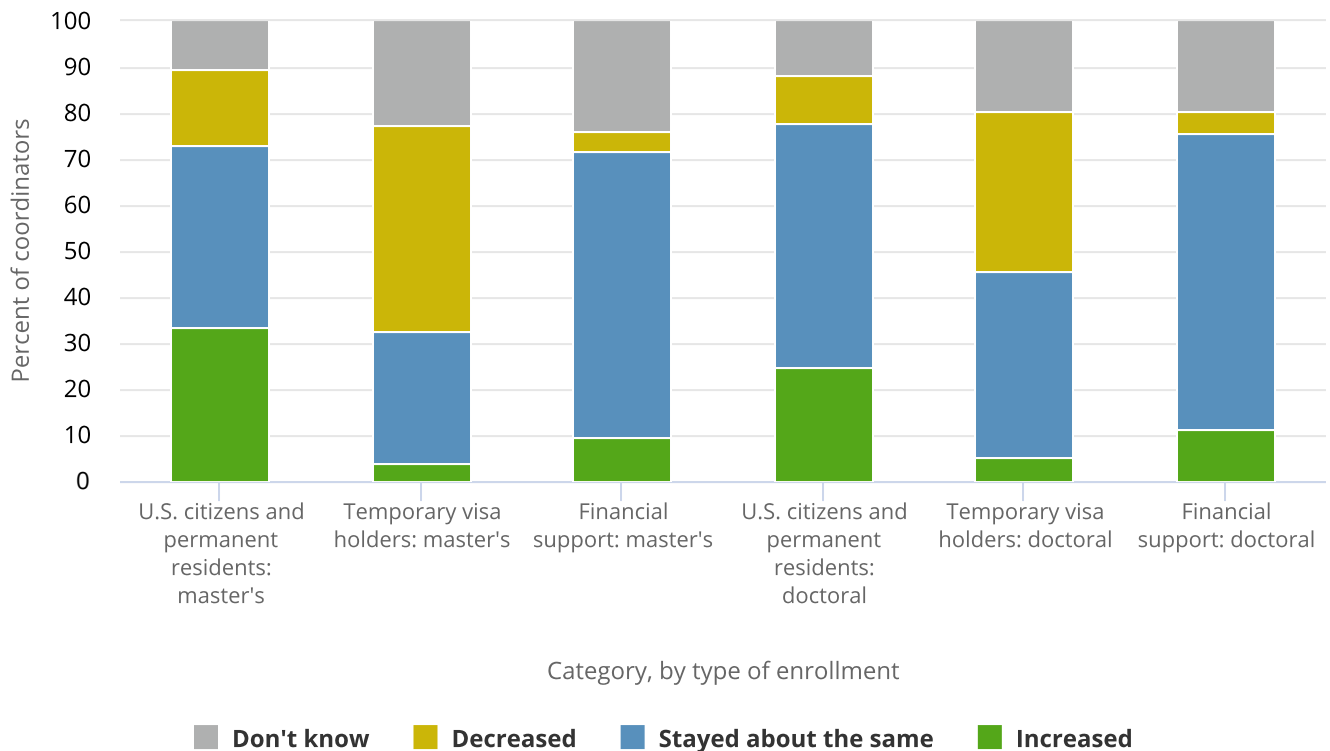
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The COVID-19 pandemic impacted the ability of colleges and universities to hold in-person classes and conduct vital research. After closures in March 2020, and the transition to largely online studies to complete the academic year, U.S. educational institutions made difficult decisions regarding how to hold classes in the fall 2020 semester. To understand the pandemic's effects on graduate science, engineering, and health (SEH) education, the 2020 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS) included a COVID Impact Module (referred to from here on as the *module*). The module included questions about the pandemic's influence on institutional practices related to doctoral funding, time-to-degree completion, and postdoctoral appointees (postdocs) and nonfaculty researchers (NFRs). These questions provide valuable information about the institutional changes related to graduate students, postdocs, and NFRs.

Articles on the impact of the pandemic on graduate education have generally focused on declining enrollment among temporary visa holders.¹ While the results of the items in the module provide some support for these findings, they also show significant variation by institution and suggest that the impact of the pandemic on fall 2020 enrollment and funding trends at schools remained difficult for many GSS coordinators, who respond to the GSS on behalf of their respective schools, to quantify even at the end of the fall term ([figure 1](#)).

This InfoBrief presents data collected in the COVID Impact Module of the National Science Foundation–National Institutes of Health (NSF-NIH) 2020 GSS, fielded at the end of the fall 2020 semester or quarter. The GSS coordinators responded to the module before completing the standard GSS, answering a series of questions about changes in policies and student counts as a result of the COVID-19 pandemic. Key findings, described below, relate to graduate (i.e., master's and doctoral) enrollment in SEH programs, doctoral funding and time-to-completion policies, and the employment of postdocs and NFRs. All of the findings discussed below are based on coordinator responses to this module and thus reflect the coordinators self-reported understanding of the changes and trends at their schools.

Figure 1**Changes in enrollment and financial support in fall 2020 compared to fall 2019, by graduate student type and citizenship status****Source(s):**

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

Graduate Student Enrollment Trends and Funding

The responses coordinators provided hint at a complex story about school-level changes in enrollment and policies resulting from the COVID-19 pandemic. The coordinators were asked if enrollment and funding of graduate students from fall 2019 to fall 2020 were approximately stable, increased, decreased, or if they did not know. Their responses provided estimates of aggregate trends across schools. Coordinators' responses also indicated a level of uncertainty—approximately 10%–12% of coordinators reported uncertainty about trends in U.S. citizen and permanent resident enrollment, 20%–23% on items related to temporary visa holder enrollment and financial support, and 11%–25% on questions related to graduate program policies at their schools (figure 1, table 1).

Table 1**Changes to graduate programs and doctoral completion and funding policies in response to the COVID-19 pandemic, by 2018 Carnegie Classification and control of institution: 2020**

(Number and percent)

Item responses	Total	Very high research activity		High research activity		All other GSS schools	
		Public	Private	Public	Private	Public	Private
Graduate programs reduced or suspended newly admitted students							
No	83.5	78.3	80.8	74.4	79.1	85.7	89.8
Yes	5.8	13.2	9.6	11.0	7.0	2.6	1.7
Don't know	10.7	8.5	9.6	14.6	14.0	11.7	8.5
Number of coordinators responding	689	106	52	82	43	230	176
Changed doctoral time-to-completion policies							
No	60.4	39.8	49.0	64.2	71.1	79.7	68.6
Yes	18.5	35.9	35.3	12.4	13.2	2.7	7.1
Don't know	21.1	24.3	15.7	23.5	15.8	17.6	24.3
Number of coordinators responding	417	103	51	81	38	74	70
Changed doctoral funding policies							
No	60.0	43.3	46.0	60.5	68.4	78.4	70.0
Yes	15.4	26.0	34.0	14.8	7.9	1.4	5.7
Don't know	24.7	30.8	20.0	24.7	23.7	20.3	24.3
Number of coordinators responding	417	103	51	81	38	74	70
Other impacts of the pandemic on graduate students							
No	72.1	56.7	68.6	59.3	75.0	76.0	82.6
Yes	27.9	43.3	31.4	40.7	25.0	24.0	17.4
Number of coordinators responding	673	104	51	81	40	225	172
Combined responses to these items							
No to all questions above	49.4	17.0	30.2	33.7	51.2	61.5	65.5
Yes to any question above	34.6	66.0	54.7	43.4	32.6	24.2	19.8
Don't know, or mix of no and don't know	16.0	17.0	15.1	22.9	16.3	14.3	14.7
Number of coordinators responding	693	106	53	83	43	231	177

GSS = Survey of Graduate Students and Postdoctorates in Science and Engineering.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

Enrollment and Funding Trends

Coordinators' responses to the items on the modules indicate that between 2019 and 2020 doctoral enrollment within schools was more stable than was master's enrollment and that enrollment over that period was more stable for U.S. citizens and permanent residents than for students on temporary visas. More specifically, the percentage of schools that reported enrollment stayed about the same between 2019 and 2020 for U.S. citizens and permanent residents was 53% for doctoral students and 40% for master's students (figure 1). For temporary visa holders, 41% of schools reported that doctoral enrollment was similar over that period, compared with 28% of schools for master's enrollment. In 2020, enrollment for students in a master's program and for temporary visa holders changed more than did enrollment for those in a doctoral program and for U.S. citizens and permanent residents.

These findings are consistent with findings from the Council of Graduate Schools and the Institute of International Education, both of which noted large proportions of schools reporting declines in the enrollment of temporary visa holders in fall 2020. Among GSS coordinators, slightly less than half (45%) reported a decrease in enrollment of temporary visa holders in master's programs, while about a third (35%) reported a decrease in doctoral students ([figure 1](#)). A small minority of coordinators indicated an increase in enrollment of graduate students on temporary visas, with 4% at the master's level and 5% at the doctoral level.

While the focus of the studies and articles referenced above has been on the decline in the number of graduate students on temporary visas, results from the module portray another facet of the story: some schools experienced an increase in the number of U.S. citizen and permanent resident graduate students during the pandemic ([figure 1](#)). Specifically, about a third (33%) of schools reported an increase at the master's level, and a quarter (25%) reported an increase at the doctoral level. A smaller proportion of schools reported declines in the number of students who are U.S. citizens or permanent residents (17% for master's students and 11% for doctoral students). Thus, while some schools reported declines in the enrollment of U.S. citizen and permanent resident graduate students in SEH, more schools reported an increase among these students.

Impacts of the COVID-19 pandemic on financial support for graduate students were similar for master's and doctoral students, and support was generally stable at over half of the schools. Specifically, over 60% of schools reported that financial support for both master's and doctoral students stayed the same ([figure 1](#)). About 10% reported an increase in financial support, and about 5% reported declining financial support.

When coordinators responded to items using the "don't know" response option, this indicated uncertainty. Coordinators reported higher levels of uncertainty regarding the enrollment of temporary visa holders and financial support (20%–24%), compared with the enrollment of U.S. citizens and permanent residents (10%–12%) ([figure 1](#)).

Changes to Policy

Coordinators responded to three questions about policy changes: (1) if graduate programs deliberately reduced or suspended newly admitted students, (2) if there were changes to doctoral time-to-completion policies, and (3) if there were changes to doctoral funding policies. For the questions about doctoral time-to-completion and funding policies, about one-fifth to one-quarter of coordinators responded that they did not know ([table 1](#)).

Responses to the policy questions differed by Carnegie Classification (at the institution level) and institutional control (public vs. private) ([table 1](#)). In general, more coordinators from very high research activity institutions than coordinators from high research activity institutions and all other GSS institution types reported that policies had changed. For example, 19% of all responding coordinators reported changing time-to-completion policies, including about 36% of coordinators at very high research activity institutions, 12%–13% at high research activity institutions, and 3%–7% at all other institution types. With respect to doctoral funding policies at very high research activity institutions, about a third (34%) of coordinators at private institutions reported changes compared with over a quarter (26%) of those at public institutions.

Overall, 6% of coordinators reported that their schools reduced or suspended programs, with more coordinators at high (7%–11%) and very high (10%–13%) research activity institutions reporting that they had reduced or suspended programs than at GSS schools in other Carnegie Classifications (2%–3%) ([table 1](#)). Coordinators at public institutions were more likely to report reduced or suspended programs. Among schools with very high research activity, 13% of coordinators at public institutions reported that they had reduced or suspended programs, compared with 10% of coordinators at private institutions. Among high research activity institutions, 11% of public institutions reduced or suspended programs, compared with 7% of private institutions. The findings on policy changes indicate that schools in public institutions and those with a research focus made more policy changes associated with the pandemic than did similar private schools and those with less of a research focus.

Postdoctoral Appointees (Postdocs) and Doctorate-Holding Nonfaculty Researchers (NFRs)

For coordinators who report postdocs and NFRs, the module asked about policy changes for these two groups of researchers. Postdocs, with their (often) term-limited appointments, were a vulnerable group during the pandemic with distinct concerns about career progress and sex disparities.² The module results highlighted the institutional policy changes (such as changes to funding, duration of appointments, and delayed or rescinded offers) and employment trends of postdocs broadly. Yet, the uncertainty, as measured by “don’t know” responses, was higher for items regarding postdoc counts and policies than for items regarding graduate students. Specifically, 27%–32% of coordinators responded “don’t know” to the items related to postdoc counts and 35%–48% responded “don’t know” to the policy items ([figure 2, table 2](#)).

Similar to graduate enrollment trends, a larger proportion of coordinators reported that enrollment declined in 2020 for postdocs with temporary visas than reported a decline for postdocs who were U.S. citizens and permanent residents ([figure 2](#)). Over half of coordinators (58%) reported that about the same number of U.S. citizen and permanent resident postdocs were enrolled in 2020 as in 2019, and just under half (48%) reported a stable number of postdocs with temporary visas during this period. Similar proportions of coordinators reported decreasing numbers of U.S. citizen and permanent resident postdocs in 2020 (7%) as did those reporting increasing numbers (8%). In contrast, almost four times as many coordinators reported decreasing numbers of postdocs with temporary visas as did those reporting increasing numbers (16% vs. 4%). As with doctoral students, enrollment of postdocs with temporary visas was affected more than enrollment of U.S. citizens and permanent residents.

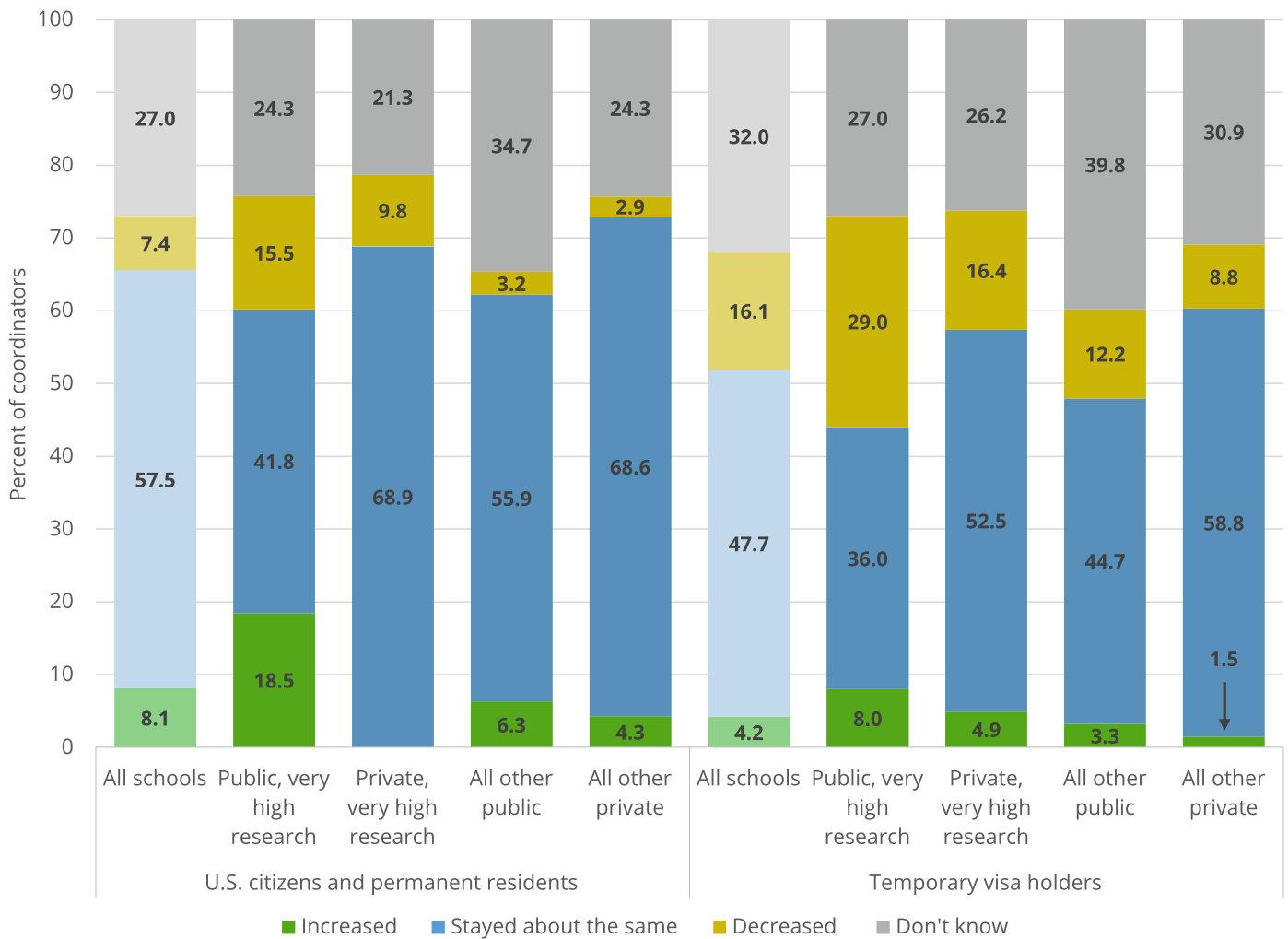
Postdoc appointment estimates varied by Carnegie Classification and institutional control ([figure 2](#)). Larger proportions of coordinators at private institutions reported that postdoc appointments stayed about the same between 2019 and 2020 than did coordinators at public institutions. For example, among very high research institutions, 69% of coordinators at private institutions reported stable counts for U.S. citizen and permanent resident postdocs compared with 42% at public institutions. This pattern holds for postdocs with temporary visas as well. Larger proportions of coordinators at public institutions reported decreasing numbers of postdocs in 2020. For example, among coordinators at very high research institutions, 29% of coordinators at public institutions reported a decreasing number of postdocs with temporary visas, compared with 16% of coordinators at private institutions.

Turning to institutional policies related to postdocs, again, differences emerged by Carnegie Classification and institutional control, much like for graduate students. Among very high research activity institutions, larger proportions of coordinators at public institutions reported delaying or rescinding offers to postdocs (32%) than did those at private institutions (23%) ([table 2](#)). Among schools with very high research activity, a larger proportion of private institutions changed postdoc funding (23%) and duration (33%) than did public institutions (17% and 24%, respectively) and other GSS institutions (less than 10%). In sum, a higher proportion of very high research activity institutions changed postdoc policies than other institutions, with a higher proportion of public institutions delaying or rescinding offers to postdocs than did private institutions and with a higher proportion of private institutions changing funding and duration policies than did public institutions.

The module included a single question about NFRs alone, asking if there were staffing reductions for NFRs. Almost half (48%) of coordinators responded “don’t know” to this item ([table 2](#)). Overall, 20% of coordinators reported staffing reductions for NFRs, including 31% of coordinators at public very high research activity institutions and 25% at private very high research activity institutions. These responses indicate that doctorate-holding research staff were vulnerable to staffing changes during the pandemic and that this is an area where more data should be collected.

Figure 2

Changes in postdoctoral researcher appointments in fall 2020 compared to fall 2019, by citizenship status and institutional characteristics (control and Carnegie classification)



Source(s): National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

Table 2**Changes to policies and hiring of postdoctoral researchers and NFRs in response to the COVID-19 pandemic, by 2018 Carnegie Classification and control of institution: 2020**

(Number and percent)

Item responses	Total	Very high research activity		All other GSS schools	
		Public	Private	Public	Private
Changed postdoctoral funding					
No	43.4	36.9	45.9	47.7	42.9
Yes	11.3	16.5	23.0	4.7	5.7
Don't know	45.3	46.6	31.2	47.7	51.4
Number of coordinators responding	362	103	61	128	70
Changed postdoctoral duration					
No	36.3	37.9	37.7	33.6	37.7
Yes	15.5	24.3	32.8	3.9	8.7
Does not apply	13.0	11.7	11.5	13.3	15.9
Don't know	35.2	26.2	18.0	49.2	37.7
Number of coordinators responding	361	103	61	128	69
Delayed or rescinded offers to postdoctoral researchers					
No	34.4	26.2	39.3	29.7	51.5
Yes	20.0	32.0	23.0	10.9	16.2
Don't know	45.6	41.8	37.7	59.4	32.4
Number of coordinators responding	360	103	61	128	68
Staffing reductions for postdoctoral researchers					
No	46.9	40.8	47.5	46.1	57.4
Yes	18.3	27.2	26.2	10.2	13.2
Don't know	34.7	32.0	26.2	43.8	29.4
Number of coordinators responding	360	103	61	128	68
Staffing reductions for NFRs					
No	32.0	25.5	23.0	31.3	51.5
Yes	20.3	31.4	24.6	14.1	11.8
Don't know	47.6	43.1	52.5	54.7	36.8
Number of coordinators responding	359	102	61	128	68
Other impacts on postdoctoral researchers or NFRs					
No	91.2	85.3	93.0	93.7	94.2
Yes	8.8	14.7	7.0	6.4	5.8
Number of coordinators responding	354	102	57	126	69
Combined responses to these items ^a					
No to all questions above	11.3	7.8	4.9	11.7	21.4
Yes to any question above	41.7	55.3	55.7	28.1	34.3
Don't know to all questions above	21.6	15.5	13.1	31.3	20.0
Mix of no and don't know	25.4	21.4	26.2	28.9	24.3
Number of coordinators responding	362	103	61	128	70

GSS = Survey of Graduate Students and Postdoctorates in Science and Engineering; NFR = nonfaculty researcher.

^a Responses of "does not apply" to the question on changed postdoctoral duration were treated as legitimate skips for the combined variable.**Source(s):**

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

Data Source and Limitations

Conducted since 1966, the GSS is an annual survey of all academic institutions in the United States that grant research-based master's or doctoral degrees in SEH fields. This report contains data collected in the COVID Impact Module, a topical module added to the 2020 GSS. Coordinators accessed the module through the 2020 GSS instrument and submitted their responses to the module separately from the standard GSS data collection.³ The module had an earlier due date than the standard GSS.

The 2020 GSS COVID Impact Module contained 22 questions in total. All coordinators received three questions on their ability to complete the standard 2020 GSS during the pandemic. Coordinators were then asked about changes to school policies related to graduate students, graduate enrollment trends, financial support, and employment and funding of postdocs and NFRs. Coordinators received the questions relevant to the populations (master's students, doctoral students, postdocs, and doctorate-holding NFRs) that they reported to the GSS.

The 2020 GSS COVID Impact Module was asked of the 890 coordinators at 805 schools (in 711 eligible institutions) who were part of the GSS at launch ([table 3](#)).⁴ For the 2020 GSS COVID Impact Module, 93% of coordinators were partial or complete respondents, with 90% of coordinators completing the module. Item nonresponse ranged from 7% to 18%, with higher item nonresponse for the questions on postdocs and NFRs than questions about graduate students ([table 4](#)).

Table 3

GSS COVID Impact Module response rates: 2020

(Number and percent)

Coordinator school characteristics	Total coordinators	Survey completion (%)	Survey partial completer (%)	Survey nonresponse (%)
All coordinators				
Number	890	799	29	62
Percent	100.0	89.8	3.3	7.0
Control				
Public	514	91.6	3.3	5.1
Private	376	87.2	3.2	9.6
2018 Carnegie Classification				
Doctoral universities: Very high research activity	233	91.8	2.6	5.6
Doctoral universities: High research activity	163	89.0	4.9	6.1
Doctoral universities: Professional	85	84.7	5.9	9.4
Master's colleges and universities: Larger programs	197	92.9	1.0	6.1
Special focus: Medical or health professions	85	89.4	3.5	7.1
All other GSS institutions	127	85.8	3.9	10.2

GSS = Survey of Graduate Students and Postdoctorates in Science and Engineering.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

Table 4**Descriptive statistics of item-level response rates on the GSS COVID Impact Module: 2020**

(Number and percent)

Item	N	Item nonresponse
Graduate programs reduced or suspended programs	787	9.5
Institutional change in definition of graduate full-time or part-time enrollment	787	9.5
Other impact on graduate students	787	11.4
Changed doctoral time-to-degree policies	494	12.1
Changed doctoral funding policies	494	11.9
Enrollment for citizen or resident master's students	765	9.9
Enrollment for visa-holding master's students	765	10.8
Financial support for master's students	765	10.1
Enrollment for citizen or resident doctoral students	494	12.8
Enrollment for visa-holding doctoral students	494	13.0
Financial support for doctoral students	494	12.8
Number of citizen or resident postdoctoral researchers	463	15.1
Number of visa-holding postdoctoral researchers	463	17.1
Changed postdoctoral funding	463	14.9
Changed postdoctoral duration policies	463	14.9
Delayed or rescinded offers to postdoctoral researchers	463	15.1
Postdoctoral researchers affected by staffing reductions	463	14.9
NFRs affected by staffing reductions	393	16.0
Other impacts	471	18.0
Ability to complete due to staff resources	890	7.3
Ability to complete due to data access	890	7.3
Any barriers to completion	890	7.2
Measures of central tendency		
Median	na	12.4
Maximum	na	18.0
Mean	na	12.4
Standard deviation	na	3.1

na = not applicable.

NFR = nonfaculty researcher.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2020 COVID Impact Module.

The full set of data tables from the 2019 GSS is available at <https://www.nsf.gov/statistics/srvygradpostdoc/>; 2020 GSS data will be available at this website once released. Data from the standard GSS survey are also available in the National Center for Science and Engineering Statistics interactive data tool (<https://ncesdata.nsf.gov/ids/gss>). For more information about the survey and the 2020 GSS COVID Impact Module, including additional tables, contact the GSS project officer, Michael Yamaner.

Notes

- 1 Baer J, Martel M. 2020. *Fall 2020 International Student Enrollment Snapshot*. New York: Institute of International Education. Available at <https://www.iie.org/-/media/Files/Corporate/Open-Doors/Special-Reports/Fall-2020-Snapshot-Report--Full-Report.ashx?la=en&hash=D337E4E9C8C9FACC9E3D53609A7A19B96783C5DB>. Redden E. 2020. New International Enrollments Fall 43%. *Inside Higher Education* November 16. Available at <https://www.insidehighered.com/admissions/article/2020/11/16/international-enrollments-drop-16-percent>. Redden E. 2021. A Pandemic Graduate Admission Cycle. *Inside Higher Education* February 18. Available at <https://www.insidehighered.com/news/2021/02/18/survey-finds-steep-decline-first-time-international-graduate-enrollments-last-fall>. Zhou E, Gao J. 2021. *International Graduate Applications and Enrollment: Fall 2020*. Washington, DC: Council of Graduate Schools. Available at https://cgsnet.org/sites/default/files/civcrm/persist/contribute/files/Final%20for%20the%20Public%20Release%20-%20Fall%202020%20Int_I%20Report%20_2021.02.17_.pdf.
- 2 Committee on Women in Science, Engineering and Medicine. 2020. *The Experiences of Postdoctoral Women During the COVID-19 Pandemic* (Virtual Meeting). Washington, DC: National Academies of Sciences, Engineering, and Medicine. Available at <https://www.nationalacademies.org/event/11-17-2020/the-experiences-of-postdoctoral-women-during-the-covid-19-pandemic>. Woolston C. 2020. Pandemic Darkens Postdocs' Work and Career Hopes. *Nature* 585:309–12. Available at <https://indico.cern.ch/event/987669/contributions/4157821/attachments/2167072/3657883/NatureSurvey1.pdf>.
- 3 GSS respondents, who respond on behalf of their schools, are called *coordinators*. Schools may have separate coordinators for reporting graduate students and postdocs or NFRs. Institutions may be split into multiple schools.
- 4 Due to changes in coordinators after the close of the 2020 GSS COVID Impact Module, this count is larger than the final count of coordinators for the main 2020 GSS.

Suggested Citation

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