U.S. HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HEARING CHARTER

The Impact of the COVID-19 Crisis on University Research

Wednesday, September 9, 2020
11:30 am – 1:30 pm ET
Cisco WebEx

PURPOSE

On Wednesday, September 9, 2020, the Subcommittee on Research and Technology of the Committee on Science, Space, and Technology will hold a hearing to examine the near- and long-term impacts of the COVID-19 crisis on the U.S. academic research enterprise. The Committee will hear about the steps universities have taken to slow the spread of the virus and the impact such measures have had on the progress of research and the pipeline of STEM talent. The Committee will explore what is needed for universities to recover from these setbacks and safely ramp up research programs. This hearing is also an opportunity for the Committee to hear testimony on the *Research Investment to Spark the Economy (RISE) Act* and *the Supporting Early-Career Researchers Act.*

WITNESSES

- **Dr. Joseph Walsh**, Interim Vice President for Economic Development and Innovation, University of Illinois System
- **Dr. David Stone**, Vice President for Research, Oakland University
- **Dr. Theresa Mayer**, Executive Vice President for Research and Partnerships, Purdue University
- **Mr. Ryan Muzzio**, Physics Ph.D. Student, Carnegie Mellon University

KEY QUESTIONS

- What challenges have universities and researchers faced in maintaining research programs and providing guidance and support to undergraduate and graduate STEM students?
- How has the COVID-19 health crisis affected undergraduate students transitioning into STEM graduate programs and recent Ph.D. graduates entering the academic and private sector job market?
- In what ways, if any, are these challenges disproportionately affecting women and individuals from underrepresented minority groups?
- What are the implications of the potential loss of talent for the U.S. research and innovation ecosystem and U.S. economic competitiveness?
- What actions can the Federal government take to help universities recover from the losses incurred due to the COVID-19 crisis, restart their research programs, and mitigate the loss of STEM talent?
- In what ways has the COVID-19 health crisis helped to catalyze and accelerate research and innovation? What actions can the Federal government take to support these activities?

ACADEMIC RESEARCH AND DEVELOPMENT

American research universities are widely recognized as the best in the world and play a pivotal role in advancing U.S. economic prosperity, national security, health care, and other national priorities. In 2018, academic institutions carried out $79.4 billion in R&D, most of it funded by the federal government.[1] Although universities perform all types of R&D, they have long been the nation's largest performers of basic research.[2] Universities also provide education and training for the majority of the STEM workforce.[3] In the federal government, six agencies provide the most support for R&D conducted at colleges and universities:

- Department of Health and Human Services (55%, or $22.9 billion)
- Department of Defense (14%, or $5.9 billion)
- National Science Foundation (13%, or $5.3 billion)
- Department of Energy (4%, or $1.8 billion)
- National Aeronautics and Space Administration (4%, or $1.5 billion)
- Department of Agriculture (3%, or $1.2 billion) [4]

COVID IMPACT ON UNIVERSITY RESEARCH

Social Distancing

On March 16, 2020, the White House issued guidelines[5] restricting gatherings of more than 10 people. On March 19, California was the first state to issue a state-wide stay-at-home order. By early April, more than 300 million Americans were under directives to "shelter-in-place" or "stay-at-home".

Measures taken to comply with social distancing restrictions created major disruptions on college and university campuses across the country. On March 6, the University of Washington became the first major university to cancel in-person classes and exams. By the middle of March, institutions across the country had followed suit and more than 1,100 colleges and universities in all 50 states cancelled in-person classes or shifted to online-only instruction.[6] While there is extensive discussion in the news and among policymakers about the status of in-person education and the related challenges unfolding on university campuses across the country, this hearing is focused on impacts on the research enterprise.

Across the board, campus closures and social distancing requirements have significantly altered the way university research is conducted. Researchers forced to work remotely or under stringent social distancing requirements are experiencing significant delays in achieving their research aims. Students are also

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[1] Additional academic R&D sponsors include academic institutions, nonprofit organizations, industry, and state and local governments.
[2] Basic research is "experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts." Source: OMB Circular A-11. Available at https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf
[3] https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/
[4] National Science Board, Science and Engineering Indicators 2020, Available at https://ncses.nsf.gov/pubs/nsb20202/.
[5] The White House, The President's Coronavirus Guidelines for America: 30 Days to Slow the Spread, Available at https://www.whitehouse.gov/wp-content/uploads/2020/03/03.16.20_coronavirus-guidance_8.5x11_315PM.pdf.
[6] National Conference of State Legislatures, Higher Education Responses to Coronavirus (COVID-19), Available at https://www.ncsl.org/research/education/higher-education-responses-to-coronavirus-covid-19.aspx

experiencing reduced access to professional development, networking, and hands-on training. For students, postdocs, and junior faculty, disruptions caused by the COVID crisis come at a critical juncture in their career and may have long-lasting impacts.

For example, many undergraduate students would normally have spent the past few months developing research skills through summer research internships. These programs offer students valuable research experience beyond their classroom studies and have a strong influence on student career aspirations. As a result of summer research internships being canceled, many students in their final year will not have the research experience necessary to prepare a competitive application to a graduate research program. The switch to remote classes has also made it difficult for students to fulfill their degree requirements, leading some students to consider switching majors due to the unavailability of required laboratory-based courses. Others are deciding to take a gap semester or year in the hopes of returning once campus is reopened and facing graduation delays as a result.

Graduate students are dealing with delays to their research due to limited access to their laboratories, which could compromise their ability to complete their projects on time and publish enough papers to be competitive for postdoctoral fellowships or research positions in industry. Graduate students are also learning how to carry out their teaching responsibilities remotely and missing out on important networking and collaboration opportunities as conferences have gone all virtual. The cumulative effect of these challenges is taking its toll on graduate student mental health. A recent survey of undergraduate and graduate students at 10 U.S. research universities found that signs of depression doubled among graduate students when compared with a similar survey from last year. Indications of anxiety among graduate students increased by 50% during the same period. Rates of mental distress were particularly high among low-income, Latinx, and LGBTQ students and those working in physical and biomedical sciences.[7]

The ability of faculty researchers to continue to make progress on their research remotely depends, in part, on the nature of the project and their discipline. For example, researchers working remotely may be able to perform certain tasks like scientific computations, modeling and simulation, experimental hardware design, data analysis, and drafting journal articles. In contrast, handling physical and biological samples, caring for laboratory animals, and building or operating specialized equipment require a researcher to be present in the laboratory. Research involving human subjects may be interrupted if those subjects are unavailable because of social distancing. In some cases, the extent to which research activities can continue may depend on the duration of the disruption; many researchers may have pivoted toward analyzing data and writing up findings for publication – tasks they can do from home - but eventually they will have run out of new data to analyze.

Another key factor in the ability of a researcher to be productive in carrying out their research remotely is childcare. Early analyses of submissions of draft research papers to pre-print servers suggest that the pandemic is disproportionately affecting female academics, because women often do more caregiving than men.[8,9]

A recent survey of approximately 4,500 Principal Investigators (PIs) at U.S. and European research institutions found that “scientists report a sharp decline in time spent on research on average, but there is substantial heterogeneity with a significant share reporting no change or even increases. Some of this

[7] https://escholarship.org/uc/item/80k5d5hw
[8] https://www.nature.com/articles/d41586-020-01294-9
[9] https://www.nature.com/articles/d41586-020-02183-x

heterogeneity is due to field-specific differences, with laboratory-based fields being the most negatively affected, and some is due to gender, with female scientists reporting larger declines. However, among the individuals' characteristics examined, the largest disruptions are connected to a usually unobserved dimension: childcare. Reporting a young dependent is associated with declines similar in magnitude to those reported by the laboratory-based fields and can account for a significant fraction of gender differences."[10]

Travel Restrictions

Travel restrictions have impeded research across all disciplines for scientists who engage in field observation work. Data sets that require months or even years of regular observations now have an irreversible break in continuity. For example, observations of the atmosphere taken routinely from passenger and cargo planes are transmitted to weather services and used in worldwide weather forecasts as well as atmosphere and climate research. The World Meteorological Organization recently released a statement expressing increasing concern over the loss of this data stream and the potential for degraded forecast accuracy.[11]

Travel restrictions and social distancing concerns have forced scientific societies to cancel or move conferences online. A scientific conference is not just an avenue for a scientist to present their research to the wider community, it is also an important venue for brainstorming, networking, and developing new collaborations. Conference cancellations also cut off a major source revenue for scientific societies, putting the societies and the vital role they play at risk. While some are optimistic that virtual conferences could add value in the long run, such a radically new model will take time to perfect.

The impact of travel restrictions has been particularly severe for students from other countries. U.S. Immigration and Customs Enforcement (ICE) issued guidance for the Fall 2020 term that prohibits new students from entering the U.S. on an F or M student visa unless they are registered for at least one in-person course.[12] According to a recent analysis by the Chronicle for Higher Education and Davidson College's College Crisis Initiative, about one-third of universities and colleges have opted for fully online or primarily online instruction.[13] Foreign students play a critical role in university research labs, and many remain in the United States and continue to contribute to our leadership in science and technology after graduation.[14]

Hiring Freezes and Layoffs

The impacts of the COVID crisis on academic employment may be long-lasting. Faced with reduced enrollment and unanticipated costs for cleaning, personal protective equipment, testing, and contact-tracing, many institutions have been forced to withdraw job offers, furlough and lay off workers, and implement hiring freezes.

[10] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3608302
[11] https://public.wmo.int/en/media/press-release/covid-19-impacts-observing-system
[12] https://www.ice.gov/doclib/sevis/pdf/bcmFall2020guidance.pdf
[13] https://www.chronicle.com/article/heres-a-list-of-colleges-plans-for-reopening-in-the-fall/
[14] https://www.nsf.gov/nsb/sei/one-pagers/Foreign-Born.pdf

Hiring freezes in academia have substantially reduced the job prospects for early-career scientists. Many graduate students and postdocs who had academic job offers at the start of the pandemic have since had those offers rescinded or delayed. Those failing to find an academic position are faced with the difficult decision to abandon their career goals in order to support themselves and their families. This potentially irreversible loss of talent from the research pipeline could have lasting negative consequences for U.S. innovation and economic competitiveness.

Facility Closures

While skeleton staff who can maintain social distancing may be an option at some research facilities—such as telescopes or environmental sensor networks that share data with researchers remotely—other facilities require intensive on-site personnel for maintenance and operation. Closures of R&D facilities depend on the independent decisions of individual agencies, universities, and other institutions. For example, the National Aeronautics and Space Administration decides the status of each of its centers separately, based on local conditions, according to a four-stage response framework.[15] Actions by state or local governments also factor into the decisions of some facilities. For example, shutdowns at Department of Energy laboratories in California and Illinois followed statewide social distancing orders issued by the governors of those states.[16] Managing organizations and contractors operating National Science Foundation facilities also consider local conditions and statewide orders in making operational decisions.[17]

COVID RECOVERY NEEDS

Suspending research has resulted in additional costs for activities such as animal care, maintenance of cell cultures and biological samples, and safe storage of hazardous materials. Moreover, restarting research, when conditions permit, will likely incur costs for staff time and supplies to bring experimental equipment back to operational status, reestablish laboratory animal populations, or replace masks and other personal protective equipment that was donated to hospitals and first responders during the pandemic. The extent to which these costs may be covered out of existing federal research awards is not yet clear.

The Office of Management and Budget, in collaboration with federal science agencies, has provided temporary administrative and salary charging flexibilities to protect against furloughs and layoffs. Agencies have provided guidance for universities and offered no-cost extensions[18] to the term of current research grants to make up for time lost. Some agencies have also extended the deadline dates for a few solicitations to give PIs more time to submit proposals or have been lenient with PIs who miss a deadline.

The Council on Governmental Relations, an association of almost 200 U.S. universities and research institutes, recently released a report presenting a model for estimating research output loss and quantifying the financial impacts of the COVID-19 pandemic on research activities. The model is designed to account for factors such as reduced work, lost laboratory supplies, and inability to travel under differing impact and recovery scenarios. The report uses five case studies to illustrate the state of research under what it terms the new "pandemic normal," and projects research output losses between March 2020 and February 2021 at individual institutions ranging between 20% and 40% and financial impact in the hundreds of millions of

[15] https://nasapeople.nasa.gov/coronavirus/nasa_response_framework.pdf
[16] https://www.aip.org/fyi/2020/pandemic-impacts-escalating-across-federal-labs
[17] https://www.nsf.gov/news/special_reports/coronavirus/NSF%20Guidance%20for%20Major%20Facilities%20and%20Contracts%20Regarding%20COVID-19.pdf
[18] A no-cost extension extends the end date of the award without increasing funding.

dollars. The report also projects a potential impact in the tens of billions of dollars across the U.S. research enterprise.[19]

NIH Director Francis Collins, while testifying before Congress on May 7, 2020 stated, "The estimates are something like $10 billion of NIH funded-research that is going to disappear because of the way in which this virus has affected everybody requiring this kind of distancing and sending people home."[20]

Significant additional federal support (through supplements and full-cost extensions[21] to existing grants, administrative flexibility, or other mechanisms) is needed to enable the U.S. research enterprise to recover after a prolonged period of profound disruption. Additional funding to support graduate students and post-doctoral researchers whose research and training have been interrupted or otherwise delayed due to the pandemic is also critical to prevent a significant loss of talent from the STEM pipeline.

In March, organizations representing research universities, medical schools, and teaching hospitals asked Congress to take a number of steps to address these needs, including giving research institutions additional flexibility to cover researcher salaries and benefits while their institutions are affected, to provide $13 billion in additional extramural research funding, and to allow agencies to reprogram any supplemental funds that are not spent within a year for new awards.[22]

LEGISLATION

RISE Act

The *Research Investment to Spark the Economy (RISE) Act* (H.R. 7308) authorizes approximately $26 billion in emergency relief across federal science agencies to award to universities and national laboratories to continue working on federally-funded research projects and ensure that years of research – and the researchers that makes it possible - are not lost forever due to the pandemic.

Supporting Early-Career Researchers Act

The *Supporting Early-Career Researchers Act* (H.R. 8044) creates a new $250 million postdoctoral fellowship program at the National Science Foundation to support career development for early-career researchers whose employment opportunities have been impacted by the COVID-19 crisis. NSF estimates that a program established under this Act would support about 1,600 fellows. [23, 24]

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[19] https://www.cogr.edu/sites/default/files/Research_COVID_August2020_COGR_FINAL.pdf
[20] https://news.bloomberglaw.com/pharma-and-life-sciences/virus-will-cost-nih-10-billion-in-lost-research-director-warns
[21] A full-cost extension extends the end date of the award and provides additional funding to cover the costs to complete the activities.
[22] https://www.aplu.org/members/councils/governmental-affairs/CGA-library/association-letter-covid-19-research-relief-letter/file
[23] https://science.house.gov/imo/media/doc/Fellowships_forINTRO.pdf
[24] In fiscal year 2019, NSF supported 5,320 postdoctoral associates through funds included in research projects, centers, or facilities awards, as well as by postdoctoral fellowships. https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf