

Potential Impact of COVID-19 Disruptions on the Next Generation of Vision Scientists

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IMPORTANCE Emerging vision scientists who have yet to be awarded their first independent funding may have their research careers disproportionately affected by early COVID-19–related disruptions. In September 2020, the Alliance for Eye and Vision Research convened a panel of 22 such scientists (nominated by their academic institutions) to communicate to the US Congress about the importance of vision research. As part of the effort, interviews were conducted with scientists about the effect of the pandemic on their research.

OBSERVATIONS Qualitative areas of adverse consequences from the early months of COVID-19 disruptions included striking interruptions of patient-based research, limits on other types of clinical research, loss of research time for scientists with young children (especially women), challenges with animal colonies and cell cultures, impediments to research collaborations, and loss of training time.

CONCLUSIONS AND RELEVANCE The early months during the COVID-19 pandemic increased career stress on many early-stage investigators in the vision field and delayed (and may potentially derail) their ability to attract their first independent research funding grant. As a result, federal and private granting agencies may need to take these factors into account to retain talented, early-stage vision researchers.

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The Alliance for Eye and Vision Research (AEVR) has a commitment to fostering the importance and funding of vision research. As part of AEVR's efforts to increase vision research awareness with the US Congress, AEVR (with grants from Research to Prevent Blindness and Novartis) hosted early-stage investigators, called *emerging vision scientists* (EVSs), to address the potential effect of the COVID-19 pandemic on their research and career path. EVSs are vision researchers who have not yet received independent funding (eg, RO-1 grants). Concerned that EVSs' research might be disproportionately affected by COVID-19–related disruptions, we convened 2 teleconferences of 22 EVSs from September 1 to 2, 2020. Our goal was to hear their concerns and prepare a video for distribution to members of Congress to illuminate relevant issues for the House and Senate to consider.

The panel included assistant professors (17), instructors (1), postdoctoral fellows (1), ophthalmology residents (2), and MD/PhD candidates (1) nominated by their institutions and reviewed by AEVR. They covered bench to bedside vision research. When reflecting on the potential effect of the pandemic on research, most of the concerns were universal. We did not ask them about their recommendations for policy change, nor did we compile how frequently each concern was mentioned. While other vulnerable researchers¹ and broad-based research areas^{2,3} have been the focus of opinion pieces, this focused on EVSs. Opinions expressed were anecdotal, and we do not know how common they were to EVSs as a whole or researchers later in their career.

The first and potential effect was on patient-based clinical research. With a nationwide shutdown in March to April, all but emer-

gency-oriented clinical research ground to a halt, not returning to baseline until September 2020 at the earliest. Many EVSs conducting patient-involved research reported feeling adrift. Several said they were "devastated" or in a "complete state of flux." Patient recruitment, enrollment, participation, and follow-up were stopped in their tracks. As the shutdown gradually lifted, the new normal was not back to pre-pandemic levels. Patients, especially older individuals, reported reluctance to come in for any visit. Some institutions mandated no research-only patient visits. For some, research visits only could be paired with clinical visits of direct benefit to the patient. Research protocols were modified to adjust to the new requirements.

Tele-ophthalmology was aided in some instances with smartphone applications, including for patients with low vision. However, eye care visits requiring imaging limited the utility of remote visits. The cumulative effect of the shutdown on ongoing research was delays of at least months, yielding gaps in clinical trial data sets. For some EVSs, this meant a loss of crucial pilot data for their first grant application, leaving them in a state of heightened anxiety about likelihood of success.

While these adverse effects were associated with clinical trials, other areas of clinical research, such as artificial intelligence studies, epidemiology, and meta-analyses, also were affected. While EVSs studying these areas were able to draw, in part, on previously collected data, delays still occurred. One EVS was delayed by low enrollment despite working on a COVID-19–centric project; its focus was on safe disinfection of ophthalmic equipment used for care of patients with COVID-19–associated conjunctivitis.

Scientists (especially women) with young children stated that their research productivity was adversely affected, citing a survey

of nearly 5000 faculty or principal investigators who reported, on average, a 50% loss of research time because of day care and school closures with the pandemic. Women scientists with young children reported productivity loss greater than any other subgroup.⁴ Thus, while time might have otherwise been available for writing new grants or papers, EVSs and younger scientists were likely to have been affected disproportionately.

Another finding was on research involving animal colonies and cell cultures. Several EVSs spoke of having to restart their research upon ending the shutdown, the result of furloughing the caretakers and the consequential loss of their experimental lines. One EVS who studies glaucoma using a mouse model told us that his research was paused for 3 to 4 months and, upon reopening, had yet to recover. One glaucoma researcher studying zebra fish discovered that his funding stream was under threat because it relied on his hospital, whose revenues had been slashed as a result of the smaller patient load. Some EVSs said the loss of animals under long-term longitudinal study has been "profound" and has "massively" set back their work. Cell cultures were also not immune to pandemic-related disruption; some were completely lost, requiring a restart that could take months to years. The loss had a cascading effect on the conduct of experiments necessary to establish proof of concept for grant applications.

Yet another challenge identified was on research collaborations. One researcher studying the genetic basis of strabismus was awaiting receipt of genetically modified mouse tissue from the only worldwide source. That laboratory in New York, located in the pandemic's earliest US epicenter, was completely shut down for months, cutting off a vital supply line. Other EVSs spoke of losing non-US born personnel forced to return to their country of origin. One EVS spoke of a potential international collaboration being planned for using smartphones to screen for diabetic retinopathy with artificial intelligence capabilities. The entire collaboration fell through owing to travel-related bans and restrictions. Future collaborations, the lifeblood of science, were under peril associated with cancellation of international meetings.

Most trainees lost crucial training time. Furthermore, training grants from the National Institutes of Health or other sources usually have fi-

nite timelines that can be difficult to extend, especially as salaries continued to be paid in many instances when laboratories were not operating. The expectation is that trainees will move to their own funding sources. Some international trainees were affected as a result of visa restrictions. Some junior faculty intent on applying for training and career development grants, such as a National Institutes of Health K grant, were delayed because they lacked pilot data.

The final potential effect was on career pathways and general anxiety about future employment. The prevailing mood was of punishing uncertainty. Junior faculty were uncertain about the path ahead as they anticipated missing a grant cycle, losing grant support, or losing institutional support as their institutions instituted financial recovery steps. Some EVSs were forced to cut back on research to focus full time on clinical care and teaching. Others considered forsaking research altogether. A universal concern was the loss to society in terms of delays or loss of potential diagnostics, treatments, or cures for eye disease.

Conclusions

In sum, these findings suggest the pandemic has increased the stress on many early-stage vision researchers, threatening their productivity (and even livelihood). As such, it may have increased the risk to our field of vision research; we maintain preeminence in part by infusion of new ideas and new investigators. If they are stymied, the entire field can be affected. Every facet of research of importance to the next generation of vision researchers faces challenges: patient recruitment, enrollment, and follow-up; access to animal models of disease; formation of collaborations; and education of trainees. However, hope is not irretrievably lost. EVSs spoke of adaptations they undertook, which may have long-lasting benefit, ie, learning to be more innovative, creative, and nimble to solve research problems; shifting research imperatives; having more time (in some instances) to be reflective, crunch data, work on manuscripts, and write grants; forging more virtual, rather than in-person, collaborations; and, in short, to endure.

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REFERENCES

1. Rao RC, Dlouhy BJ, Capell BC, Akeju O. The endangered physician-scientist and COVID-19. *Cell Rep Med.* 2021;2(2):100190. doi:10.1016/j.xcrm.2021.100190
2. Harper L, Kalfa N, Beckers GMA, et al; ESPU Research Committee. The impact of COVID-19 on research. *J Pediatr Urol.* 2020;16(5):715-716. doi:10.1016/j.jpuro.2020.07.002
3. Singh JA, Bandewar SVS, Bukusi EA. The impact of the COVID-19 pandemic response on other health research. *Bull World Health Organ.* 2020;98(9):625-631. doi:10.2471/BLT.20.257485
4. Myers KR, Tham WY, Yin Y, et al. Unequal effects of the COVID-19 pandemic on scientists. *Nat Hum Behav.* 2020;4(9):880-883. doi:10.1038/s41562-020-0921-y