Title: The U.S. academic job market survives the SARS-CoV-2 global pandemic

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Abstract:

Many speculated that the faculty job market would be severely impacted by the COVID-19 pandemic, potentially for years. Our examination of faculty job postings from 2018 to 2021 found that while they decreased in 2020, the market recovered in 2021. We also surveyed how the pandemic affected the perceptions, behaviors, and outcomes of individuals on the faculty job market in 2019–20 and 2020–21. Approximately 10% of the faculty job offers made to 2019–20 survey respondents were reported as rescinded. Respondents also reported altering their application documents in response to the pandemic as well as delaying or even abandoning their faculty job search. Thus, while the faculty job market may have recovered, the effect of the pandemic on postdoctoral career choices may have future implications.

One-Sentence Summary:

The COVID-19 pandemic resulted in changes of perceptions and behaviors of individuals on the faculty job market.

Main Text:

In January 2020, the United States recorded their first case of COVID-19, a disease caused by the virus SARS-CoV-2 (Fig. 1). Most states in the US enacted stay-at-home orders by spring 2020, with regionally variable mitigation measures in place throughout 2020 and 2021. The COVID-19 pandemic impacted nearly every sector of society, including higher education. The University of Washington was the first institution to close its campus on March 7, 2020 (*1*). Harvard University followed days later, evacuating student residences (*2*). The spring and summer of 2020 saw the closures of institutions bankrupted after mandatory stay-at-home orders (*3*, *4*) and remaining institutions enacted measures in response to the unprecedented financial conditions, many of which targeted hiring. Unofficial reports cite at least 400 instances of frozen or canceled faculty searches and other impacts on hiring (*5*), further destabilizing the already precarious academic market (*6*).

As of January 2022, official tallies report over 280 million cases and 5 million deaths worldwide (*7*). Emerging data reveal the catastrophic impact of the pandemic on the career trajectories of academics, especially women (*8–11*). Furthermore, the negative sentiment of US postdocs toward the academic job market from 2019 to 2020 increased by 50%, and 11% of postdocs delayed their job search (*11*, *12*). These data point to the strong negative effect that the pandemic has had on postdocs persisting in academia. These data suggest that a consequence of the pandemic may be an eroded number of postdocs who apply to or occupy faculty positions in the future.

The academic faculty job cycle generally begins in July, with postings for a start date in one year; posts peak in October, in anticipation of December/January first-round interviews, and on-site interviews early the following year (Fig. 1). Offers are usually made in the spring, with the search concluding in June. Given the profound changes that occurred in academia in 2020 and our previous work on the complex and often obscure faculty job search process (*13*), we sought to track pandemic-related shifts in job search experiences, outcomes, and applicant perceptions using two surveys: an early pandemic (May 2020) survey of outcomes for the 2019–20 cycle (n=791), and a mid-pandemic (November 2020) survey as applicants entered the 2020–21 cycle (n=78).

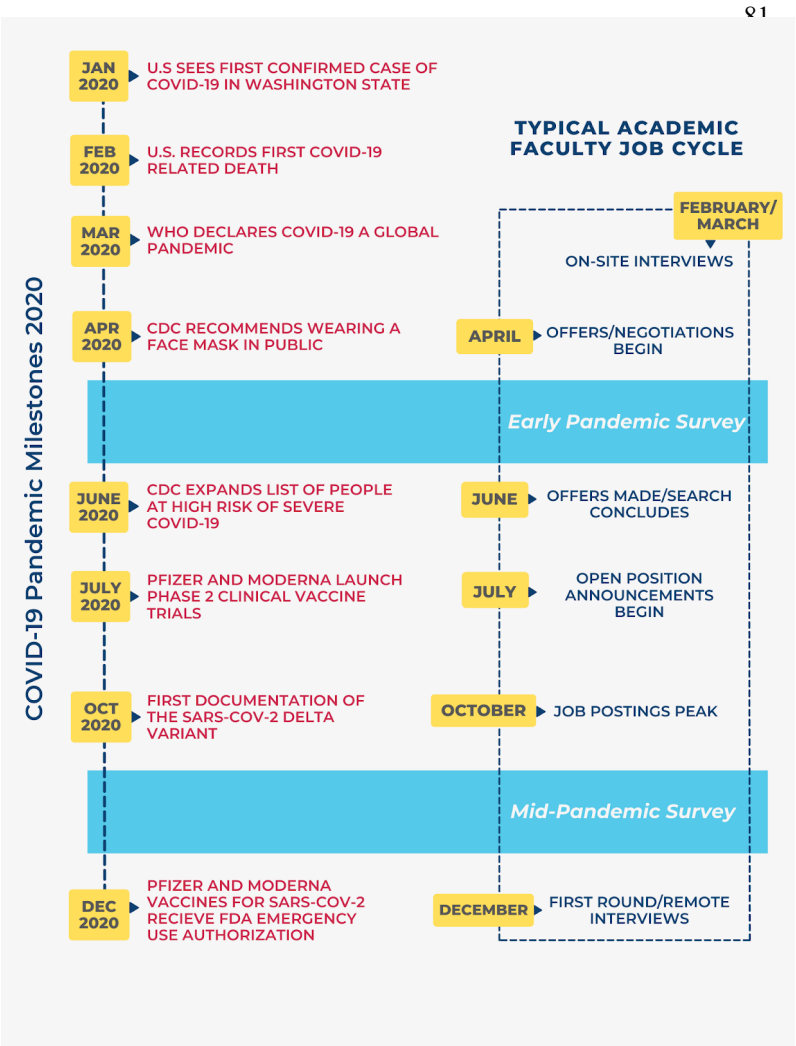

Fig. 1. Summary of the faculty job market with COVID-19 pandemic milestones in 2020. The COVID-19 pandemic impacted the faculty job cycle with campus closures and stay-at-home orders occurring during the on-site interview period. We administered survey questions at two points, May and November 2020.

We first asked whether there were abrupt changes in faculty job offers during the pandemic. In the early pandemic survey, we asked respondents from a larger survey on 2019–20 academic job search outcomes whether the pandemic affected their search (see SI for methods). Of the 467 offers made to survey respondents, 48 (10.3%) were rescinded by the institution, and 10 were rejected by applicants for pandemic-related reasons. We next analyzed the rescinded offers by applicant and institutional demographics. More men (15%) reported having an offer rescinded compared to women (11%) (Fig. 2A; $p = 0.66$). We observed no significant difference ($p = 0.50$) in the percent of offers rescinded by field, though geosciences (21%) and biological sciences (18%) respondents reported the most rescinded job offers compared to other fields (Fig. 2B). Survey respondents that reported being Caucasian-American/North African or Middle Eastern (30%) or Asian (23%) experienced more rescinded offers (Fig. 2C). Research intensive (RI) institutions (14%) had a significantly higher ($p = 0.009$) rate of rescinded offers compared to primarily undergraduate institutions (PUIs; 4%; Fig. 2D). When analyzed by the US geographic region, institutions in the Pacific US had the highest percentage of rescinded offers (18%; Fig. 2E).

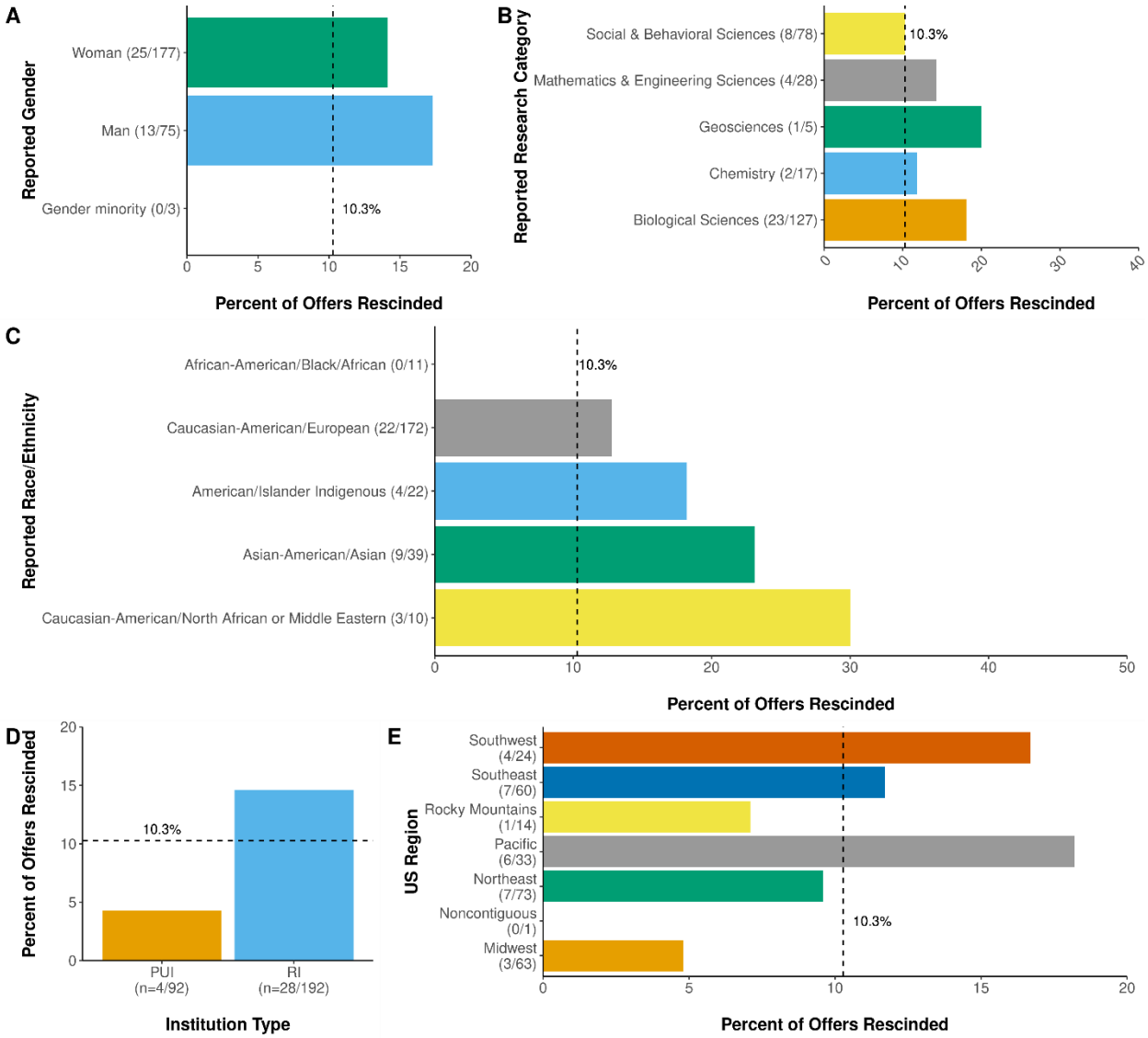

Fig. 2. The percent of assistant professor job offers rescinded during the 2019-2020 hiring cycle according to applicant and institutional demographics. Survey respondents who indicated that they received faculty offers were asked to name the institutions that they received offers from and to indicate how many of those offers were rescinded. The percent of offers rescinded were calculated based on the respondent's A) Reported gender (p=0.73), B) Reported research category (p=0.56), C) Reported race/ethnicity (p=0.14), D) US institution type (p=0.09), and E) the US region of the institution extending the offer (p=0.37). The vertical, dashed black line indicates the percent of offers rescinded across all responses. Non-responses to the question regarding rescinded offers were omitted from the analysis. In parentheses, the number of offers rescinded/the number of offers. P-values obtained using Fisher's exact test.

While offers rescinded were certainly devastating to the affected individuals (*14*), the largest impact was likely yet to come. The faculty job search is well known as a highly competitive, grueling process in which applicants submit a median of 15 applications each year to a dwindling number of opportunities (*13*). In fall 2020, postdocs reported an increasingly negative perception

of the academic job market due to the pandemic and many delayed their search accordingly (*11*). To understand if these fears aligned with the data, we analyzed 2018–21 job posting data (Fig. 3). The number of tenure-track positions of all levels were consistently lower in 2020. They started low, lagged throughout the fall, and never quite reached the peaks seen in 2018 or 2019 (Fig. 3A). This lag was previously described by *Science* as the market "tanking", using data through September 2020 (*14*), but an analysis of assistant professor postings showed a lag in postings that eventually reached pre-pandemic levels in October (Fig. 3B). Furthermore, the 2021 posting cycle appears on par with, if not higher than, the 2018 and 2019 cycles, suggesting that the number of Assistant Professor positions bounced back after a period of uncertainty (Fig. 3A and 3B, Fig. S1). The largest effect appeared to be on temporary faculty positions, whose numbers are generally erratic and were low throughout 2020 (Fig. 3C). Responses to the interruption in the market also differed by institution type and region, perhaps pointing to the year-by-year variability that makes the market generally erratic (Fig. 3D and 3E).

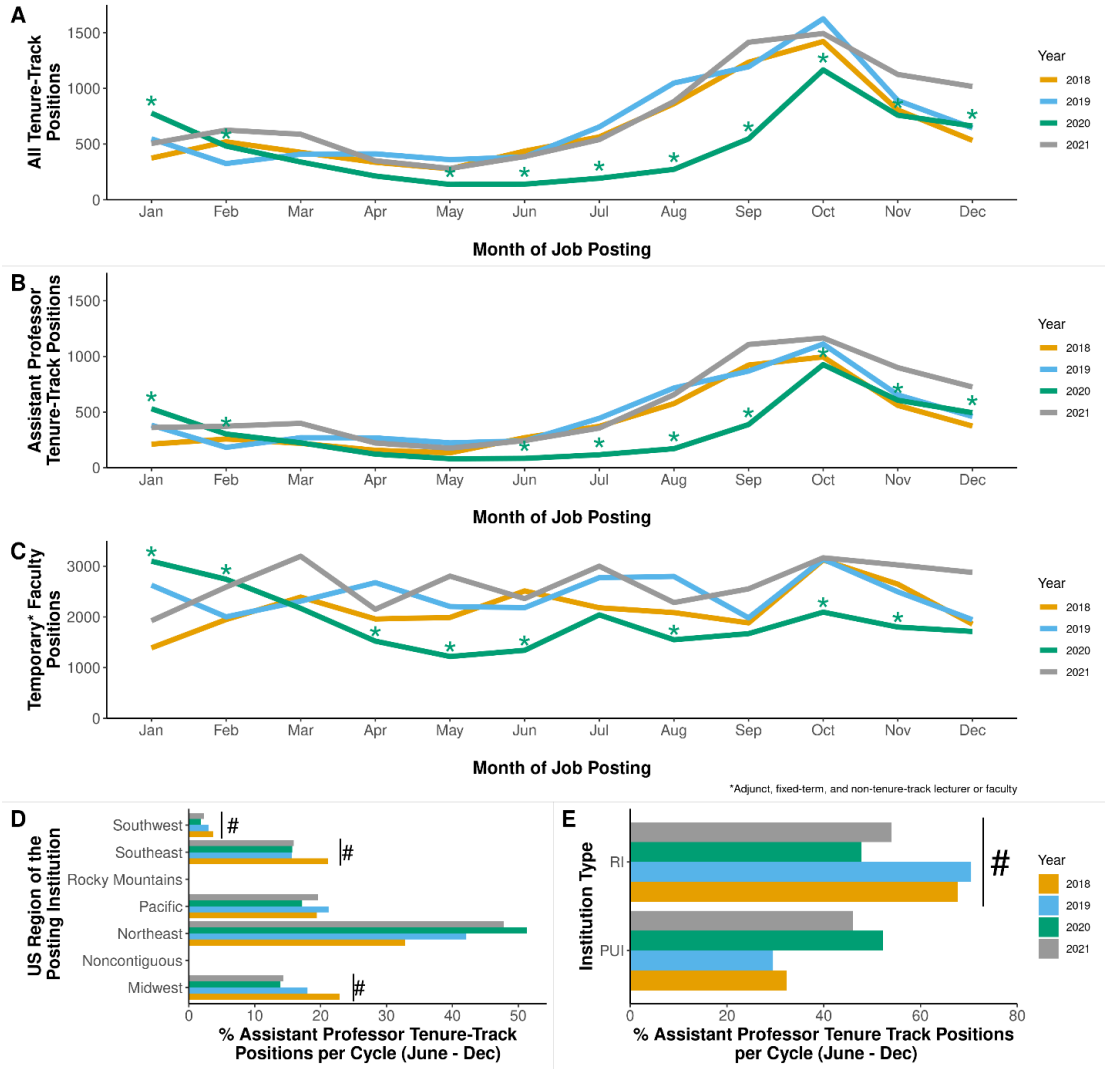

Fig. 3. The impact of the COVID-19 pandemic on the academic job market. Job posting data from January 2018 to December 2021 were obtained from the Higher Education Recruitment Consortium (HERC) and plotted for each year according to the month the jobs were posted and the job type: A) All tenure-track positions ($p<0.001$), B) assistant professor tenure-track positions ($p<0.001$), and C) temporary faculty positions ($p<0.001$), which included adjunct, fixed-term, and non-tenure-track lecturers or faculty (not postdoctoral positions). The percent of positions posted for each year (June to December) were plotted according to the D) US region and E) institution type (RI or PUI). P-values obtained using (A-C) Pearson's X^2 test with Bonferroni correction and (D-E) one-way ANOVAs with a Tukey multiple comparison of means. $p<0.001$ = *; $p<0.05$ = #.

Because the pandemic accelerated the adoption of virtual learning modalities and temporarily halted pandemic-related bench research, we were curious how much applicants for assistant professor positions modified their application documents in response to the pandemic. In our early pandemic survey, we asked applicants whether they altered their research to focus on remote-friendly/computational research. In the mid-pandemic survey, we asked applicants whether they altered their teaching statements to focus on remote learning and their research statements to focus on computational approaches and/or added pandemic-related research questions.

We found that applicants in the social and behavioral sciences were more likely to alter their research statements to focus on remote-friendly/computational research at higher rates (37% and 18% in the mid- and early-pandemic surveys, respectively) than individuals working in the chemical (8% early and 0% mid-pandemic) or biological sciences (9% early and 22% mid-pandemic) (Fig. 4A and 4B). We also found in the early pandemic survey that first-generation PhD respondents were more likely to alter their research statement to focus on remote/computational research (13.5% versus 7%) (Fig. 4C). The mid-pandemic survey indicated that on average 20% and 22% of respondents, altered their research statements to "add pandemic-related topics" or "be more remote-friendly", respectively (Fig. 4B). This was higher for those applying to PUIs (>30% adding pandemic-related and/or remote-friendly research) versus those applying to RIs (~20%). Over 45% of applicants (46% RI; 50% PUI) modified their teaching statements to include more online teaching practices (Fig. 4D).

To understand the prospective outlook of applicants on the academic market, our mid-pandemic survey asked respondents: "Are you currently applying for faculty jobs in the United States or Canada with an anticipated start date in 2021 or 2022?". The difference in response rates to this question were statistically significant ($\chi^2=44.97$, df=2, $p<0.001$). Approximately 69% of respondents were applying during the 2020-21 job cycle while 16.7% decided to wait and 12.8% decided to change career paths and look for employment opportunities outside academia. These data are consistent with the 11% of respondents to the Morin, et al study who reported delaying their job search due to the pandemic (*11*).

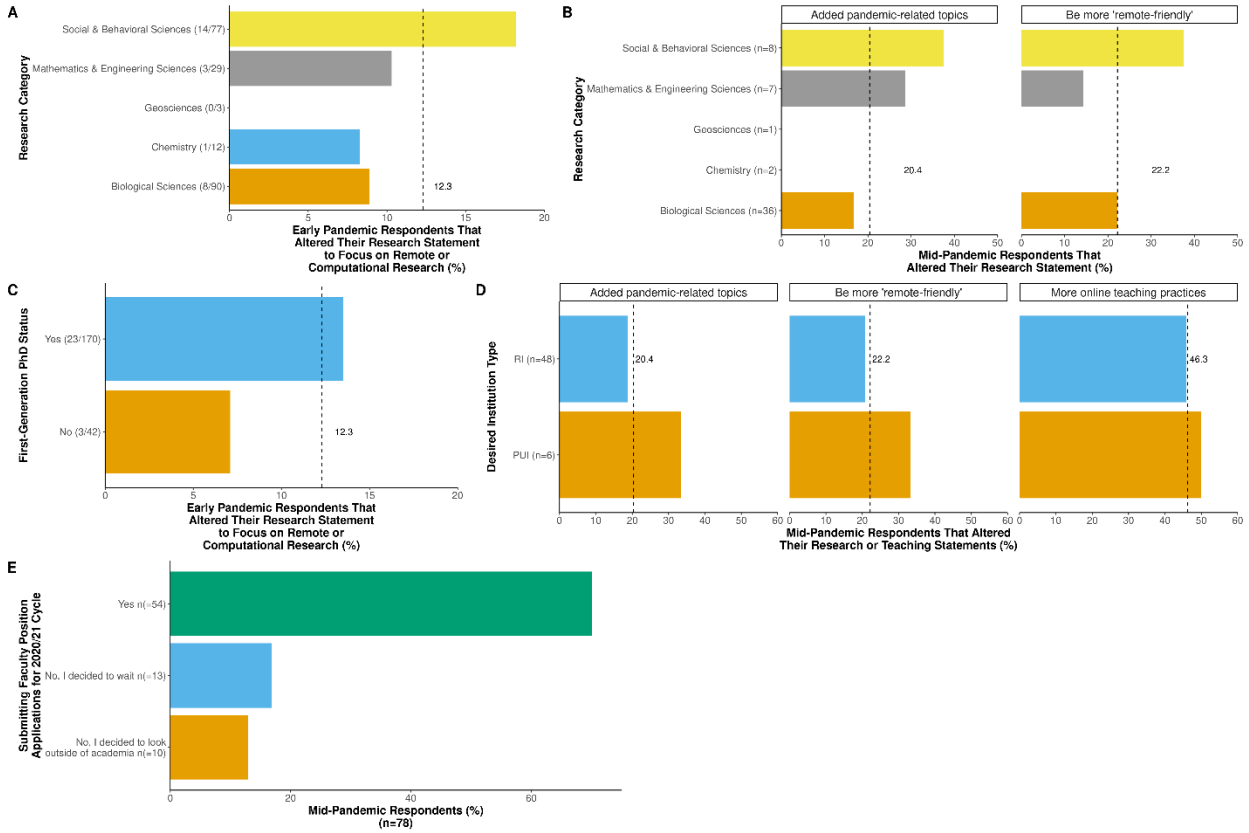

Fig. 4. A comparison of early and mid-pandemic attitudes on search strategy and academia. The percent of respondents in each research category from A) the early pandemic survey that altered their research statements to focus on remote or computational research (p=0.43), and B) the mid-pandemic survey that altered their research statements to (*right panel*) include pandemic-related areas (e.g., coronavirus or COVID-19) when they would not have otherwise done so (p=0.59) and/or (*left panel*) to be more "remote-friendly" (p=0.81). C) The percent of early pandemic respondents that altered their research statement to focus on remote or computational research based on their first-generation PhD status (p=0.43). D) The percent of mid-pandemic respondents interested in either RIs or PUIs that altered their research statements to (*left panel*) add pandemic-related research (p=0.59) or (*center panel*) be more remote friendly (p=0.6) and/or (*right panel*) those who altered their teaching statements to include more online practices (p=1). E) The responses (%) of mid-pandemic respondents when asked about their plans to submit faculty position applications during the 2020-2021 hiring cycle (p<0.001). n = the number of respondents. The vertical, dashed line (black) indicates the percent for all groups pooled together. P-values obtained from (A-D) Fisher's exact test and (E) the X^2 test for given probabilities.

Our study investigated the impact of the COVID-19 pandemic on the 2019–20 and 2020–21 academic job cycles in the United States. We quantified the number of rescinded offers as well as the decrease in available academic opportunities during 2020. We also described the modifications

that respondents made to their application materials as they prepared for the 2020–21 academic cycle compared to the previous cycle, which included a pivot to pandemic-related and remote-friendly research.

Our data support previous reports that faculty job postings were severely reduced in 2020 by 20 to 30% (*12*, *14*, *15*). Our data also demonstrated the year-to-year variability in academic opportunities across region and institution type such that any disruption causes a potentially devastating loss of unique positions. Furthermore, the decisions by some institutions in response to the initial uncertainty of the pandemic's effects on university budgets was to pause or cancel job searches (*5*), which has caused long-lasting career impacts to postdocs. Many applicants are on the faculty job market for several years, and spend considerable resources and time training as well as preparing their applications for each cycle (*13*). The COVID-19 pandemic increased the amount of time that some will be on the faculty job market while prompting others to abandon their search (*12*).

With a return to pre-pandemic posting numbers in 2021, the faculty job market appears to have survived, but will applicants continue to? In an already hypercompetitive environment, over 10% of the applicant pool has delayed applying, which will exacerbate the situation in future job cycles (Fig. 4E, *11*). Furthermore, the pandemic resulted in reduced productivity and/or increased mental health concerns for many scientists due to increases in care responsibilities, illness, financial constraints, and lockdowns (*16*). The reduction in productivity, decreased job prospects, and a general negative perception of the market has left many postdocs facing difficult career decisions, such as delaying or abandoning their academic goals (*11*, *14*). Future work is necessary to examine the impact of pandemic-initiated budget reductions on future academic cycles and applicant outcomes.

An unanticipated result was the low percent of early-pandemic respondents who adapted their application materials. While some groups such as the social sciences and first-generation PhDs were more likely to alter their applications, the group averages were 12% (Fig. 4). Unfortunately, our surveys did not query the motivation(s) of respondents to modify (or not) their applicant materials. It's possible that the early pandemic respondents expected the pandemic to end quickly and/or had more faith in the durability of academia and the feasibility of bench research. As the pandemic progressed, respondents were twice as likely to have altered their research materials and nearly half altered their teaching statements. The necessary pivot to alternative formats for research, instruction, and collaboration suddenly expanded access to work-from-home models that increased accessibility to the academic workplace. While there are certainly groups, particularly across the United States, calling for a complete "return to normal" it remains unlikely that higher education will ever look like it did in 2019 -- and perhaps it shouldn't. The lasting impact of the pandemic-induced disruption has provided academia with a unique opportunity to evaluate and change the system for the better.

Structural inequities in the United States academic sector have long had a negative impact on faculty recruitment, retention, and promotion, particularly for women and gender minorities, those from historically underrepresented backgrounds, and those with caregiving responsibilities. The pandemic has exacerbated these inequities and accelerated the subsequent consequences–the attrition of talented individuals from a system that wasn't designed to support them. After the significant decrease in faculty job opportunities in 2020, higher education was also impacted by the 'Great Resignation' (*17*, *18*): a pattern of resignations in late 2021 (*19*). Attributed to widespread dissatisfaction with wages, career trajectory, and lack of social support from employers, the Great Resignation doesn't appear to have changed the inequitable policies, practices and norms that hamper the ability of many academics to conduct research, publish, and successfully compete for funding. A lack of affordable and reliable childcare and education options coupled with partial vaccine eligibility for children and inconsistent mitigation strategies at daycares and schools all force caregivers to make difficult choices that pit career advancement against safety. Insufficient institutional support for research/teaching loads, untenable supply chain delays, threat and burden of a potentially debilitating illness, repeated periods of isolation, and increasingly limited time to meet inflexible expectations all reinforce these disadvantages. Ironically, those most vulnerable to these systemic holes in support are those most needed to diversify the academy. Swift and strategic investments are required to address these pressures and mitigate lasting damage to such participants in the academic job market.

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Acknowledgments:

The authors would like to thank Dr. Karen Kelsky (Professor is In) for her crowd sourced list of institutional hiring freezes; and the Higher Education Research Consortium (HERC) for providing their job-posting data for analysis.

Funding:

The Burroughs Wellcome Fund, # 1022092 (NMJ)

Author contributions: Each author's contribution(s) to the paper should be listed [we encourage you to follow the CRediT model]. Each CRediT role should have its own line, and there should not be any punctuation in the initials.

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Visualization: AdH

Funding acquisition: AmH, AdH, NMJ, CTS, AJK

Resources: NMJ, CTS

Writing – original draft: AmH, AdH, NMJ, CTS, AJK

Writing – review & editing: AmH, AdH, NMJ, CTS, AJK

Competing interests: Authors declare that they have no competing interests.

Data and materials availability: An aggregated dataset and code are available at https://github.com/akhagan/Kozik_COVID-19_Science_2022.

Supplementary Materials:

Materials and Methods

Fig. S1