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EDITORIAL

Functional Ecology | BRITISH ECOLOGICAL SOCIETY

The influence of the global COVID-19 pandemic on manuscript submissions and editor and reviewer performance at six ecology journals

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Abstract

1. Government policies attempting to slow the spread of COVID-19 have reduced access to research laboratories and shifted many scholars to working from home. These disruptions will likely influence submissions to scholarly journals, and affect the time available for editors and reviewers to participate in peer review.
2. In this editorial we examine how journal submissions, and editorial and peer review processes, have been influenced by the pandemic at six journals published by the British Ecological Society (BES).
3. We find no evidence of a change in the geographic pattern of submissions from across the globe. We also find no evidence that submission of manuscripts by women has been more affected by pandemic disruptions than have submissions by men—the proportion of papers authored by women during the COVID period of 2020 has not changed relative to the same period in 2019.
4. Editors handled papers just as quickly, and reviewers have agreed to review just as often, during the pandemic compared to pre-pandemic. The one notable change in peer review during the pandemic is that reviewers replied more quickly to emails inviting them to review (albeit only 4% sooner), and those who agreed to review returned their reviews more quickly (17% sooner), during the pandemic.
5. We thus find no evidence at these six ecology journals that submissions and peer review processes have been negatively impacted by the pandemic. Also, contrary to analyses in other disciplines, we do not find evidence that there have been disproportionate impacts of the pandemic on female authors and reviewers.

KEYWORDS

authorship, editorial boards, gender, pandemic, peer review

1 | INTRODUCTION

The COVID-19 pandemic, and government policies attempting to slow the spread, has affected many aspects of both our personal and professional lives. University research laboratories in much of the world were shut down starting in March 2020, with the research community shifting to working from home. Though many universities have allowed researchers to partially resume onsite activities, ongoing restrictions continue to affect how many of us work. This has impacted, and will continue to impact, our research output. Scholarly publishing is an important aspect of that output for many in, and out, of academia.

While it is too early to fully understand the effects of the pandemic on scholarly publishing, preliminary observations have suggested that

submissions to journals have generally increased during the pandemic (Bell & Fong, 2020; Squazzoni et al., 2020), likely because many researchers lost access to their laboratories for some time and switched over to writing papers (Aubry et al., 2020). However, analyses of submissions to preprint servers (Cui et al., 2020; King & Frederickson, 2020; Viglione, 2020; Vincent-Lamarre et al., 2020) and journals (Bell & Fong, 2020; Kibbe, 2020; McCormick, 2020; Muric et al., 2020; Shurchkov, 2020; Squazzoni et al., 2020; but see Dolan & Lawless, 2020) suggest that submissions from women have either grown less than those from men, or have even declined, though the magnitude and presence of the gender difference has varied among disciplines. A decrease in the proportion of submissions authored by women suggests that the productivity of female scholars has been more substantially impacted by pandemic disruptions, compared to the productivity of male scholars, likely because many communities have closed primary schools, childcare facilities, and other public and private institutions that help manage children (Alon et al., 2020). Women shoulder a disproportionately high share of family responsibilities (Ecklund & Lincoln, 2016; Mason et al., 2013; Sallee et al., 2016) and are more likely than men to reduce their work hours (e.g. shift to part-time work) or leave science in response to childcare responsibilities (Cech & Blair-Loy, 2019). Surveys conducted since March 2020 show that women, especially those with children, have reduced their work time more substantially than have men since the start of the pandemic (Collins et al., 2020; Myers et al., 2020; Yildirim & Eslen-Ziya, 2020).

While writing and submitting manuscripts is the first and most important step in scholarly publishing, those papers then need to be evaluated by journal editors and peer reviewers, who are also mostly academics editing and reviewing for journals as unpaid community service. Because editing and reviewing requires a substantial time commitment, events that negatively impact the time availability of researchers, such as the pandemic, could also reduce their ability or willingness to participate in peer review. However, the impact of the pandemic on journal operations has not received much attention. One exception is a study of journals published by Elsevier (Squazzoni et al., 2020), which found that reviewers have been less likely to agree to review since the start of the pandemic, though the presence and magnitude of a gender difference in reviewing varied among disciplines.

In this editorial, we explore how journal submissions and editorial and peer review for the journals of the British Ecological Society (BES) have been influenced by the COVID-19 pandemic. We make use of the BES's database of journal submissions to test hypotheses about the effect of the global pandemic on submissions and the peer review process. The database includes complete peer review histories for papers submitted to the journals *Functional Ecology* (FE), *Journal of Animal Ecology* (JAnim), *Journal of Applied Ecology* (JAppl), *Journal of Ecology* (JEcol), *Methods in Ecology and Evolution* (MEE) and *People and Nature* (PaN). We ask whether the start of the global pandemic is associated with (a) increased submissions to these journals; (b) a decrease in the proportion of submissions authored by women; (c) delays in editorial handling of manuscripts; (d) decreases in the proportion of reviewers agreeing to review, especially for female reviewers; and (e) increases in the time taken by reviewers to reply to review invitations and/or to submit their reviews.

2 | THE DATASET AND ANALYSES

We limited our analyses to submissions of standard research papers, submitted from 1 January 2019 to 1 October 2020. We excluded reviews, commentaries and other non-standard or invited papers. We used the genderize.io database to infer author gender from author first names (using genderizeR, Wais, 2016), as in previous studies (Fox & Paine, 2019; Fox et al., 2018, 2019). Details on how data are extracted and analysed are presented in these previous publications by Fox and colleagues.

To test whether submissions to the journal and journal operations have been impacted by the pandemic, we had to establish a date that we could consider to be the start of the disruptions. We chose 15 March 2020 as the start of the COVID disruption period for these analyses, and consider submissions before 15 March 2020 as pre-COVID and submissions on 15 March 2020 and after as during-COVID. This is roughly the middle of the 2- to 3-week period during which the majority of universities in the United States, United Kingdom and France (and many other countries) shifted to remote research and teaching. Countries, and even regions or universities within countries, vary in the dates that they instituted stay-at-home orders and the degree to which they exclude researchers from their offices and laboratories. This variance is not captured in these analyses. We extracted submission data from ScholarOne starting on 2 October 2020, so the end date for our analyses is 1 October 2020, giving us approximately 6.5 months of submissions during the pandemic.

Throughout the rest of this editorial we make two primary comparisons: (a) Data for papers submitted between 15 March and 1 October 2020 compared to papers submitted during that same range of dates (15 March to 1 October) in 2019 and (b) submissions received pre-15 March in 2020 compared to submissions from 15 March to 1 October 2020. Comparisons are all made using SAS Proc Glimmix (Zhu, 2014), with the error distributions either binomial (for data that are probabilities) or normal (for log-transformed time data), and including journal identity and (when relevant) editor identity as random effects. Any exceptions or caveats to these analyses are described when appropriate.

3 | HAS THE PANDEMIC AFFECTED JOURNAL SUBMISSIONS OR REVIEWER RECRUITMENT?

3.1 | Number of submissions

Despite the onset of the pandemic, the number of research papers submitted to these six journals increased from 2,803 submissions (total across journals) between 15 March 2019 and 1 October 2019

to 3,239 submissions during this same time period in 2020, an increase of 15.6%. Every journal had a submissions increase, though the magnitude of the increase varied from a low of 6.3% (*Methods in Ecology and Evolution*) to highs of 27.7% (*Journal of Ecology*) and 52.5% (*People and Nature*, which was a new journal in 2019 and thus expected to grow quickly between 2019 and 2020). The number of papers submitted between 15 March and 1 October increased from 2019 to 2020 for most regions of the world (Figure 1). Unfortunately, we do not have enough data to test whether specific regions or countries have been more greatly impacted than others by COVID disruptions.

3.2 | Editor turnaround times

Each of the BES journals uses a similar editorial model, with Senior Editors performing an initial evaluation of each manuscript and deciding whether to decline the paper or send it to an Associate Editor for further consideration. The Associate Editors then decide whether to send the paper for review and, if so, they invite reviewers. There are too few Senior Editors at each journal to be able to generalize from their handling times. However, each journal has a large population of Associate Editors. We thus focus our analyses at the Associate Editor level.

Despite the occasional anecdote from members of our editorial board apologizing for delays caused by the pandemic, we see no evidence in our data that these delays are widespread. Instead, the average time between when a paper was received by an Associate Editor to when the first reviewer was invited has not changed since the pandemic began, increasing only 3% (from 5.72 to 5.88 days, averaged across journals) from 2019 to 2020 ($X^2_1 = 0.22$, $p = 0.64$; comparing papers submitted 15 March to 15 September in each year). Similarly, if we compare pre- versus during-COVID within 2020, we see no evidence that Associate Editors have taken longer

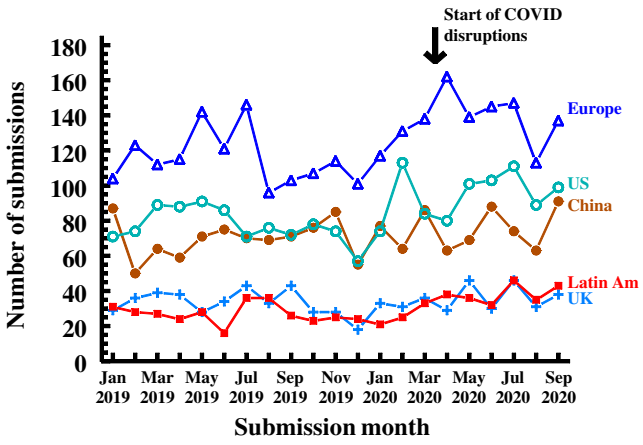

FIGURE 1 Monthly number of submissions, cumulative across the five journals, from five major regions of the world, mainland Europe (△), the United States (US; ○), China (●), the United Kingdom (UK; +) and Latin America (North and South America, excluding the US and Canada; ■)

to select reviewers since the start of the pandemic ($X^2_1 = 0.88$, $p = 0.35$). These results remain unchanged (i.e., $p > 0.34$) if we exclude papers submitted after 30 August to ensure we do not bias our post-COVID estimates downwards by excluding the most delayed papers.

One possibility for why we do not see a decline in editor turnaround times since the start of the pandemic is that the editors who are most impacted by the pandemic have left the editorial board of their journal, or requested reduced workloads. Indeed, some editors have resigned from the editorial boards of the BES journals, and others have requested reduced workloads, since the start of the pandemic. We do not have adequate records to compare pre- versus during-pandemic, but the anecdotal data we have suggest that there has been little impact of the pandemic on editor participation. For example, at *Functional Ecology*, we currently have only six Associate Editors (of >100; four women and two men) on brief leave from editorial duties, but such leaves are common, especially during periods of field research or during periods of heavy teaching. Three Associate Editors have resigned from the *Functional Ecology* editorial board since the start of the pandemic, but all did so to take on other editorial or administrative responsibilities, and none specifically referenced the pandemic as a contributor to their resignation.

3.3 | Recruitment of reviewers and reviewer turnaround times

The proportion of reviewers that failed to respond to the email inviting them to review has increased during the pandemic, albeit only slightly, from 1.7% pre-COVID (15 March to 31 August 2019) to 2.3% during COVID (15 March to 31 August 2020; we excluded papers submitted in September to avoid counting slow responses as non-responses; $X^2_1 = 5.83$, $p = 0.02$). The pattern is the same when comparing pre-March 15 with post-March 15 within 2020: 1.5% of invitees failed to respond pre-COVID compared to 2.5% during COVID, a statistically significant but small difference ($X^2_1 = 16.5$, $p < 0.001$).

Of reviewers who responded to the review invitation, there was no decline in the proportion agreeing to review since the start of COVID disruptions; the trend is actually towards an increase in the proportion agreeing to review whether we compare the period 15 March to 1 October 2020 with the same period in 2019 (2019: 34.5%, 2020: 35.7%, $X^2_1 = 2.23$, $p = 0.14$) or compare pre- versus during-COVID in 2020 (pre: 35.2%; post: 35.9%; $X^2_1 = 1.09$, $p = 0.30$). Reviewers also responded more quickly to email invitations during COVID in 2020 compared to the same period in 2019, though the effect size is again small (days to respond, averaged across journals, 2019: 3.83 ± 0.30 days; 2020: 3.69 ± 0.18 days; $X^2_1 = 12.6$, $p < 0.001$).

More strikingly, reviewers are returning their reviews more quickly during COVID (Figure 2). This contrasts with the perception of some (but not all) journal Assistant Editors that they have received more email requests for extensions since the start of the pandemic. Of those who agreed to review, reviewers submitted their reviews

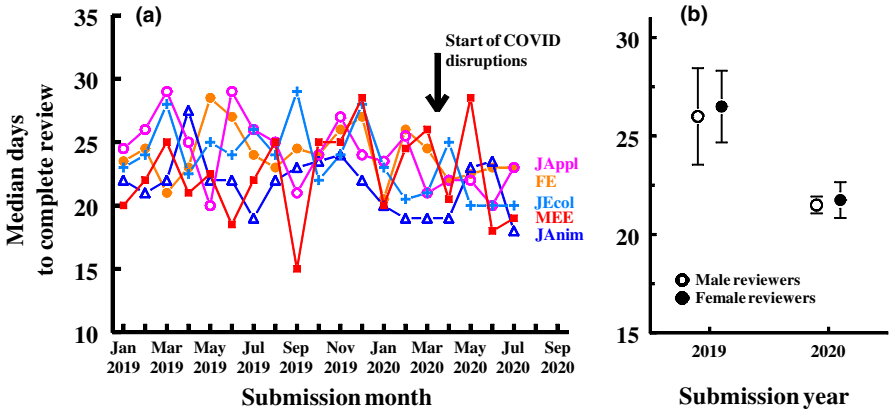

FIGURE 2 The median time (days) to complete reviewing a manuscript after agreeing to review. Papers submitted after 31 July 2020 are excluded to minimize undercounting of late reviews in the during-COVID period of 2020. (a) Monthly medians for each journal. *People and Nature* is not shown because sample sizes are small and the among-month variability very large. (b) Comparison of papers submitted between 15 March and 31 July in 2019 versus 2020. The *y*-axis is the average (±*SEM*) of the individual journal medians. Both male and female reviewers submitted their reviews sooner in 2020 (after the start of the pandemic) than in the previous year, with no evidence of a gender difference

>4 days (17%) sooner during the COVID period of 2020 (median 22.0 days) compared to the same period in 2019 (median 26.4 days; $X^2_1 = 33.3$, $p < 0.001$). This difference is not due to reviewers being generally faster in 2020 than in 2019—reviewers submitted their reviews >2.5 days (9%) more quickly during COVID (from 15 March) compared to pre-COVID within 2020 ($X^2_1 = 6.71$, $p = 0.01$). To avoid biasing the during-COVID sample against late reviews, we excluded papers submitted after 31 July 2020 for these comparisons. The effect of undercounting late reviews on the medians reported for the during-COVID sample is at most very small; the proportion of agreed reviewers failing to submit their reviews is only 1.6% greater during COVID in 2020 than for the same period in 2019, a difference that changes little when we change the cut-off date for the analysis. Also, the difference in the time-to-review remains statistically significant if we also exclude July from the analysis (comparing 2019 to 2020; $X^2_1 = 19.7$, $p < 0.001$) and so is unlikely due to inadvertent exclusion of especially late reviews.

4 | HAS THE PANDEMIC HAD DISPROPORTIONATE IMPACTS ON FEMALE AUTHORS AND REVIEWERS?

4.1 | The representation of women among authors

Women were first authors on 40.9% of all submissions to these six ecology journals between 1 January 2019 and 1 October 2020 (averaged across journals), though this percentage varied among journals from a high of 51.0% to a low of 30.5% (Figure 3a). Women were similarly represented among submitting authors (the person who submitted the manuscript to ScholarOne Manuscripts); 39.4% of submitting authors were women (averaged across journals), though this varied among journals from a high of 50.2% to a low of 29.9% (Figure 3b).

There is no evidence that the proportion of women among either first or submitting authors has declined since the start of COVID disruptions. The trend was for women to be better represented as authors during the pandemic period of 2020 (15 March to 1 October) than during the same period in 2019. 41.0% of all submitted manuscripts had a female first author during the COVID period of 2020, compared to just 39.9% of all papers in the same period of 2019 (Figure 3c; $X^2_1 = 2.0$, $p = 0.16$), and 40.1% of papers had a female submitting author in 2020, compared to just 38.6% in 2019 (Figure 3d; $X^2_1 = 2.6$, $p = 0.11$). We likewise see no decline in the representation of women among authors when we compare submissions pre-15 March in 2020 with submissions from 15 March to 1 October 2020. 42.8% of first authors were women for pre-COVID submissions, compared to 41.0% during COVID ($X^2_1 = 0.01$, $p = 0.99$), and 40.0% of submitting authors were women pre-COVID submissions, compared to 41.5% during COVID ($X^2_1 = 0.01$, $p = 0.95$).

The results so far indicate that there has been no decline in the proportion of women among first and submitting authors to these six ecology journals. However, first authors are commonly students, post-docs and early career researchers. In ecology, last authors are commonly the 'senior' member of the research team (Duffy, 2017), which is the person who mentored the other authors during the study. These senior authors may generally be older and at a different stage of the family life cycle and are thus impacted differently by the pandemic than are first authors. We find that although women are a much smaller proportion of last authors (27.4%, averaged across journals) than they are of first or submitting authors (40.9% and 39.4% respectively), the pre- versus during-COVID comparisons are qualitatively similar to those for first and submitting authors. Women were equally well represented as authors both before and during COVID when we compare the same periods (15 March to 1 October) in 2019 and 2020 (25.5% in 2019 versus 26.3% in 2020, averaged across journals;

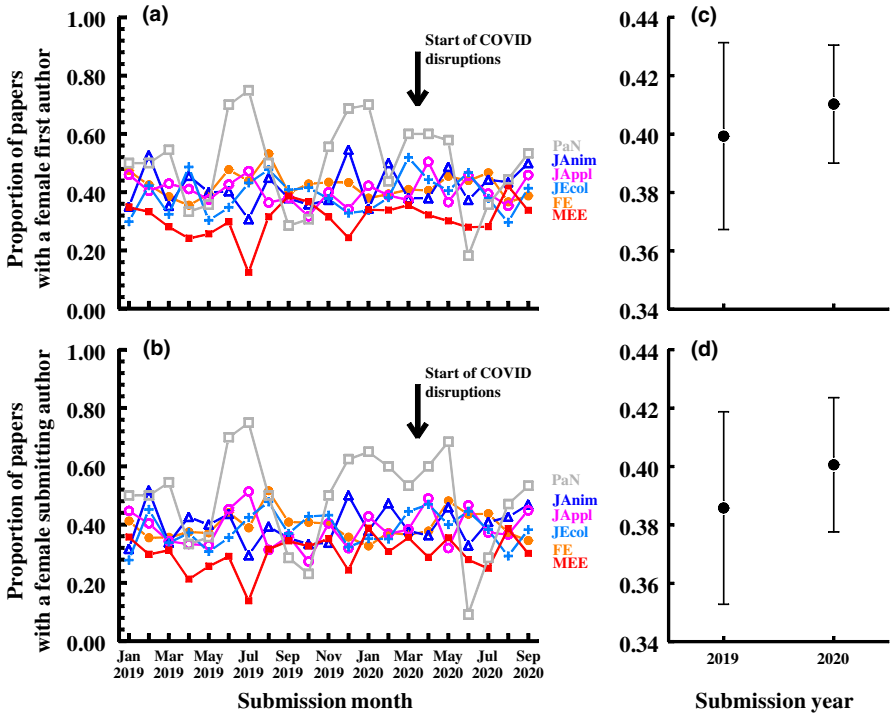

FIGURE 3 The proportion of papers for which the (a, c) first or (b, d) submitting author is a woman, for six of the journals published by the British Ecological Society. In total, these six journals received 9,264 submissions from 1 January 2019 to 1 October 2020 (inclusive). Panels (c) and (d) present a comparison of papers submitted between 15 March and 31 July in 2019 and 2020. The *y*-axis is the average (±*SEM*) of the individual journal medians

$X^2_1 = 0.23$, $p = 0.63$), and there was at most a suggestion of a small (not statistically significant) decrease in the proportion of female authors when we compare pre-March 15 with post-March 15 in 2020 (29.7% pre-March 15; 26.5% post-March 15; $X^2_1 = 2.31$, $p = 0.13$).

In previous studies of submissions to ecology journals (Fox et al., 2016, 2018), we observed that female first authors are less likely to serve as corresponding authors than are male first authors. In the current dataset (1 January 2019 to 1 October 2020), 82.0% of papers were submitted by the first author (averaged across journals). If time availability has been more greatly affected by the pandemic for women than for men (as suggested by survey data; Collins et al., 2020; Myers et al., 2020; Yildirim & Eslen-Ziya, 2020), we might observe that, although women continued to be authors of their research manuscripts, they are more likely to defer the submission process to their co-authors during the pandemic. However, there is no evidence that the proportion of either male or female first authors that serve as submitting author has declined during the pandemic (comparing pre-March 15 with post-March 15 in 2020; male: $X^2_1 = 2.05$, $p = 0.15$; female: $X^2_1 = 0.03$, $p = 0.86$), nor do we see any evidence that the proportion of men or women serving as submitting author declined from 2019 to 2020 (comparing 15 March 2019 to 1 October 2019 with the same period in 2020; male: $X^2_1 = 3.83$, $p = 0.051$; female: $X^2_1 = 0.22$, $p = 0.64$).

Our conclusion from these analyses is that for these six ecology journals there is no evidence that submission of manuscripts by women has been more affected by COVID-19 disruptions than have submissions by men. It is important to be clear, though, that these analyses only capture submissions during a short window of time, and many of these papers may have been written before the COVID disruptions. Also, researchers working from home may be prioritizing writing (and reviewing) over other tasks. It is possible that gender differences in submissions will arise in the coming years, when research that is (or should be) being done now is finally being prepared for publication. To test whether that is the case, we will need to revisit these analyses over the next several years.

4.2 | Recruitment of male and female reviewers

As described above, individuals invited to review have been slightly, but statistically significantly, less likely to respond to email invitations since the start of the pandemic. However, there is no evidence that this decline in response rates has been greater for invited women than for invited men. 2.1% of invited women failed to respond to the email invitation during COVID (for papers submitted since 15 March) compared to 1.4% during the same period in 2019, and 2.4% of invited men failed to respond during COVID compared to 1.2% during the same period in 2019 (gender difference: $X^2_1 = 0.00$, $p = 0.96$, gender × year interaction: $X^2_1 = 2.54$, $p = 0.11$). We see no evidence of a gender difference in the effect of the pandemic on how quickly invitees respond to the reviewer invitation (comparing the same period, 15 March to 1 October, in 2019 versus. 2020; gender × year interaction, $X^2_1 = 0.75$, $p = 0.39$). Also, of those who responded to review invitations, there was no gender difference in the proportion of invitees who have agreed to review ($X^2_1 = 0.87$, $p = 0.35$), and no evidence of any gender difference in the effect of the pandemic (comparing the same period in 2019 versus 2020; gender × year interaction, $X^2_1 = 0.01$, $p = 0.92$).

Lastly, though reviewers are submitting their reviews >4 days more quickly during the pandemic than before the pandemic

(Figure 2a, analysis presented above), there is no evidence that this shortening of the review time differs between men and women (Figure 2b; gender × year interaction, $X^2_1 = 0.27$, $p = 0.60$). There is also no evidence that women are less likely to submit their reviews than are men (of those who agreed to review; $X^2_1 = 1.87$, $p = 0.17$), nor was there any evidence that the probability that a review was submitted changed in response to the pandemic differently for men and women (gender × year interaction; $X^2_1 = 0.18$, $p = 0.67$).

4.3 | Final thoughts

The transition to remote working by universities and other businesses, and the need to socially isolate to reduce transmission of COVID-19, have profoundly disrupted nearly every aspect of scholarly research. It is inevitable that these disruptions will reduce the amount of scholarly research done during the pandemic, and it is a reasonable prediction that women will be more greatly impacted than men if they bear a greater share of the increased caretaker workload caused by the closing of schools and childcare facilities. However, contrary to analyses of submissions to preprint servers and other journals, and contrary to the speculation of editors on social media (Flaherty, 2020), we do not see evidence at this time that there has been a decline in the number of submissions by women to the ecology journals published by the BES. We also do not see evidence of a change in the pattern of submissions from across the globe, despite some areas being particularly heavily impacted by early pandemic disruptions. Of course, papers being submitted today are the result of work done months or years prior to submission, and so it may be too early to begin seeing the pandemic's impacts on journal submissions. The effects of disruptions caused by COVID-19 may not become evident for months or years to come.

Although we do not yet see a differential in the effect of COVID-19 on submissions by men and women, the widespread closing of primary schools and childcare facilities will have disproportionately large and possibly long-term effects on some members of our scholarly community. It is thus critical that academic institutions and scholarly societies develop the infrastructure—both procedures and policies—for addressing the various inequalities that have been and will continue to be created by this pandemic. Most importantly, these institutions need to support early career researchers—our students and recent graduates—whose careers are most vulnerable to extended disruptions to their research and the resulting reduced scholarly productivity. Vincent-Lamarre et al. (2020) provide a list of suggestions for how best to support our vulnerable colleagues, many of which, we are pleased to see, have been adopted by leading universities.

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DATA AVAILABILITY STATEMENT

Data are archived in Dyrad Digital Repository https://datadryad.org/stash/dataset/doi:10.5061/dryad.34tmpg4j5 (Fox & Meyer, 2020).

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