1-1-2024

The Intersection of Gender, Caregiving, and Research Productivity During the COVID-19 Pandemic: A Multi-Method Study

Elizabeth A. Moschella-Smith
University of New Hampshire, Durham

Sharyn J. Potter
University of New Hampshire, Durham

Comments

This is an Open Access article published in Gender and Women's Studies, available online: https://dx.doi.org/10.31532/GendWomensStud.5.2.001

Recommended Citation

Moschella-Smith, E. A., & Potter, S. J. (2024). The Intersection of Gender, Caregiving, and Research Productivity During the COVID-19 Pandemic: A Multi-Method Study. Gender and Women's Studies.

RESEARCH ARTICLE

The Intersection of Gender, Caregiving, and Research Productivity During the COVID-19 Pandemic: A Multi-Method Study

Elizabeth A. Moschella-Smith[1]*, and Sharyn J. Potter[1]

[1]Prevention Innovations Research Center, University of New Hampshire, USA

Abstract

The COVID-19 pandemic differentially impacted the productivity of women researchers with children compared to men, with and without children. The purpose of the present study was to examine the relationship between gender, caregiving responsibilities, and research productivity before and during the pandemic. We quantitatively and qualitatively analyzed survey (n=227) and follow-up interview data (n=44) collected from faculty and staff at a Carnegie Classification Research 1 public university. Findings suggest that women researchers with children faced increased caregiving demands and diminished research productivity during the pandemic, compared to men with children and researchers without children. As illustrated by the qualitative data, both women and men researchers with children noted challenges related to caregiving. However, women with children were more likely to cite the impact that increased caregiving demands had on their productivity and career trajectory. Our results highlight the need for institutional supports to mitigate the negative impacts of the pandemic on the career trajectories of women researchers with children.

Open Access

Citation: Moschella-Smith, EA, Potter, SJ., The Intersection of Gender, Caregiving, and Research Productivity During the COVID-19 Pandemic: A Multi-Method Study. *Gender and Women's Studies*, 2024; 5(2):1.

Received: June 10, 2024
Accepted: September 03, 2024
Published: September 10, 2024

Corresponding author:
Elizabeth A. Moschella-Smith, Prevention Innovations Research Center, University of New Hampshire, USA
E-mail: Elizabeth.moschella@unh.edu

Keywords

Gender inequity, research productivity, caregiving, COVID-19, career trajectory

Introduction

The mandatory closure of university physical facilities in the United States (U.S.) during the COVID-19 pandemic significantly impacted both the careers of researchers and their production of scientific work. Academic researchers faced job loss, reduced pay, and an increase in work demands while transitioning to remote work (National Academies of Sciences, Engineering, & Medicine, 2021). The COVID-19 pandemic negatively affected the research productivity and work-life balance of women in academia, particularly women with children living at home, compared to men (Ciciolla & Luthar, 2019; Craig & Churchill, 2021; Feng & Savani, 2020; Hjálmsdóttir & Bjarnadóttir, 2021; Kerr *et al*., 2021; Malisch *et al*., 2020). Our paper presents quantitative and qualitative data gathered from a sample of faculty and staff at a Carnegie Classification Research 1 (R1) public university to examine how the COVID-19 pandemic impacted research productivity and caregiving responsibilities of women and men researchers in academia across three time periods (i.e., the year before and the first two years of the pandemic).

Literature Review

Gender & Research Productivity

Gender inequities in the workplace and at home are well-documented (Allen *et al*., 2021; Bianchi *et al*., 2000; Braun *et al*., 2008; Burstin & Arora, 2021; Casad *et al*., 2021; Cohen *et al*., 2019; Murphy *et al*., 2022; Oliker, 2011; Stamarski & Son Hin, 2015; Tricco *et al*., 2020). In the U.S. labor force, with few exceptions, women earn less (Bishu &Alkadry, 2017; Blau & Kahn, 2020) and bear greater caregiving responsibilities than men (Braun *et al*., 2008; Del Boca *et al*., 2020; Oliker, 2011). In academia, women with children report lower research productivity than

men with and without children (Astegiano *et al*., 2019; Burstin & Arora, 2021; Mayer *et al*., 2017). Further, women in academia often engage in higher levels of professional service, including mentoring colleagues and advising students, compared to their male colleagues (Bird *et al*., 2004; Guarino & Borden, 2017; Hirshfield & Joseph, 2012; Pyke, 2011, 2014). Women also have higher peer-review invitation acceptance rates than men in academia, indicating women take on greater service responsibility (Squazzoni *et al*., 2021). Service work is time-consuming and can negatively impact women's research productivity (Bird *et al*., 2004). Although service work is integral to academic operations, it is not always considered crucial for advancement and promotion (Cardel *et al*., 2020; Bird *et al*., 2004; Misra *et al*., 2021).

At institutions of higher education, the COVID-19 pandemic exacerbated the differences in men and women's research productivity (Anderson *et al*., 2020; Feng & Savani, 2020; Kitchener, 2020). For example, a recent meta-analysis of 55 studies published between 2020 and 2022 documents the large gender disparity in research productivity resulting from the pandemic (Lee *et al*., 2023). In another study, Ribarovska and colleagues (2021) reported a significant reduction in the number of women authors, relative to men, on peer-reviewed articles published between 2019 and 2020. Cui and colleagues (2021) also found that the number of preprints of women in academia dropped 13.2% relative to men during the 10 weeks after the lockdown in the U.S. began. Further, research documents gender disparities in service work among academics during the pandemic. Specifically, women reported higher rates of professional service (e.g., committee work, student support and mentoring, manuscript peer review) than men in the initial stages of the pandemic (Dönmez, 2022; Woitowich *et al*., 2021). However, much of this research focuses on the first few months after physical facilities closed, as opposed to the continued impacts once universities resumed normal operations. The current study expands upon this literature by examining the continued challenges faced by researchers in the aftermath of the pandemic.

Gender & Caregiving

In general, women bear a greater responsibility for childcare and household labor than men (Bianchi *et al*., 2000; Braun *et al*., 2008; Del Boca *et al*., 2020; Oliker, 2011). For instance, studies show that women spend more time caring for children, specifically school-aged children, compared to men (Gerstel & Gallagher, 2001; Revenson *et al*., 2016). Another study by Ciciolla and Luthar (2019) found that married women with children were primarily responsible for child adjustment, such as being vigilant about children's emotional needs and engaging with their children's teachers. Women also spend significantly more time on housework than men, and compared to men with children, women with children report sole responsibility for household activities and routines (e.g., arranging schedules, maintaining order; Ciciolla & Luthar, 2019; Del Boca *et al*., 2020).

The COVID-19 pandemic exacerbated the gender gap in caregiving and household responsibilities between men and women (Dunatchik *et al*., 2021; Frank *et al*., 2021; Johnston *et al*., 2020; Power, 2020; Yildirim & Eslen-Ziya, 2021). The mandatory school and daycare closures, followed by intermittent and sporadic closures due to COVID-19 exposure, resulted in an increased need for childcare and remote schooling. Research shows that women disproportionately shouldered this responsibility (Craig & Churchill, 2021; Delaney *et al*., 2021; Feng & Savani, 2020; Hjálmsdóttir & Bjarnadóttir, 2021). For instance, Del Boca and colleagues (2021) documented that women spent significantly more time providing childcare and remote schooling than men, even when both partners were working remotely. Additionally, even when partners held the same job during the pandemic, there was still a greater disparity between men and women in household responsibilities and childcare needs (Frank *et al*., 2021).

The unequal distribution of caregiving during COVID-19 had repercussions for women's workplace productivity (Collins *et al*., 2021; Cui *et al*., 2021; Dang & Nguyen 2021; Dias *et al*., 2020). For example, women with children were more likely to reduce their work hours or leave the workforce altogether compared to men (Collines *et al*., 2021; Landivar *et al*., 2020). Indeed, one study by Collins and colleagues (2021) found that women with young children reduced their work hours four to five times more than men. Of the women who remained in the workforce, some research suggests that productivity rebounded quickly once universities resumed normal operations (Lee *et al*., 2023). However, there is limited research on the continued impacts of the pandemic, particularly among caregivers. Therefore, the present study adds to this research by quantitatively and qualitatively examining the relationship

between gender, caregiving responsibilities, and research productivity across three time periods (i.e., the year before and the first two years of the pandemic).

Conceptual Framework

Women in academia face a series of challenges that often impede their research careers, which may explain why there are fewer women tenured professors than men in academia (Colby & Fowler, 2020). These challenges were exacerbated by the pandemic and have long-term impacts on women career trajectories (Collins *et al*., 2021; Cui *et al*., 2021; Dang & Nguyen 2021; Dias *et al*., 2020; Ribarovska *et al*., 2021). Researchers have referred to the process of recruiting and retaining research faculty, particularly women, as a "pipeline" (Alper 1993; Cimpian *et al*., 2020; Metcalf, 2010). This process often begins in high school or college and continues through graduate school into their careers. However, there are many timepoints along this "pipeline" where students and faculty leave the field or "leak-out" despite their interest and qualifications (Berryman, 1983; Gregor *et al*., 2023; Skrentny & Lewis, 2022).

Research has documented a series of internal, such as lack of motivation, and external factors, such as gender harassment and lack of departmental support, that result in this leaky pipeline (Acker, 1990; Gregor *et al*., 2023; Kabat-Farr & Cortina 2014; Raabe *et al*., 2019). Among faculty who have left their research careers, or "leaked-out" of the pipeline, women report more dissatisfaction with their work compared to men (Ferri *et al*., 2016). Specifically, women felt they were not able to put the skills they acquired during their graduate and postdoctoral training, into practice. Women also cited professional service demands as a reason for leaving the field more than men (Ferri *et al*., 2016). This is particularly important as women report higher levels of professional service compared to men (Bird *et al*., 2004; Guarino & Borden, 2017; Hirshfield & Joseph, 2012).

In addition, women reported leaving their research careers due to lack of cooperation in their research teams (Ferri *et al*., 2016). This may be reflective of gender bias and harassment (e.g., exclusion, undermining competence) that is common in academia (Chawla *et al*., 2019; Else, 2018; Fairchild *et al*., 2018). Further, both men and women cited the inability to balance their work- (e.g., publishing, teaching) and home-life responsibilities (e.g., caregiving) as reasons for leaving the field (Ferri *et al*., 2016). In particular, women faculty noted that long and irregular work hours left little time for home-life activities. However, among faculty who stayed in their position, women more frequently reported postponing having a family due to the work-life imbalance compared to men (Ferri *et al*., 2016).

The Current Study

The present study aimed to examine the impact of the COVID-19 pandemic on research productivity (i.e., peer-review publications, grant proposal submissions, and conference presentations) for women and men, with and without children living at home, using quantitative and qualitative data. Our hypotheses included:

> Hypothesis 1: Women will report fewer research productivity outcomes than men, before and during the COVID-19 pandemic.
>
> Hypothesis 2: Caregivers will report fewer research productivity outcomes than non-caregivers, before and during the COVID-19 pandemic.
>
> Hypothesis 3: Women with children living at home will report fewer research productivity outcomes than men with children living at home, women and men without children living at home, and women and men with no children, before and during the COVID-19 pandemic.

Method

Procedures

During the fall 2021 semester, all faculty and staff at a Carnegie Classification R1 University who engage in research activities (*N*=844) were invited to participate in a research study about the impacts of the COVID-19 pandemic. The University's Office of the Senior Vice Provost for Research invited faculty and staff via email, which included the link to a confidential survey on changes in research productivity outcomes, work-related challenges resulting from the COVID-19 pandemic, and supports desired from the university. Upon completion, participants were invited to volunteer for a 15-20 minute semi-structured interview to further describe the impact of the pandemic on their work experiences and career trajectory. Participants self-selected into the study (i.e., survey and interview) and

gave their informed consent prior to participation in the research. The study was conducted in accordance with the research team's Institutional Review Board for the Protection of Human Subjects in Research (IRB-FY2021-90).

Participants

Two hundred and twenty-seven faculty and staff (26.9%) completed the survey and 44 of the survey respondents (19.4%) participated in the follow-up interview. Participant demographics are presented in Table 1. Compared to non-respondents (i.e., faculty and staff who were invited but did not participate), our sample included a higher percentage of women (62.1% compared to 52.0% of non-respondents). Our sample was comparable in terms of university position (52.0% tenure-track faculty for both samples, 24.7% non-tenure track faculty compared to 31.0% of non-respondents, 14.8% research staff compared to 12.0% of non-respondents, and 8.5% postdoctoral researchers compared to 5.0% of non-respondents).

Table 1. Demographic information by gender (N=227)

Characteristic	Women (*n*=141) *N* (%)	Men (*n*=85) *N* (%)	Total (*n*=227) *N* (%)
Children			
Children Living at Home	78 (55.7)	38 (44.7)	116 (51.5)
Children Not Living at Home	23 (16.4)	20 (23.5)	43 (19.2)
No Children	39 (27.9)	27 (31.8)	66 (29.3)
Marital Status			
Single	11 (8.6)	8 (10)	19 (9.2)
In a Relationship	10 (7.8)	4 (5.0)	14 (6.7)
Married	104 (81.3)	66 (82.5)	170 (81.7)
Divorced/Separated	3 (2.3)	2 (2.5)	5 (2.4)
Sexual Orientation			
Heterosexual	120 (85.1)	75 (88.2)	195 (86.3)
Non-heterosexual	21 (14.9)	10 (11.8)	31 (13.7)
Age			
18-34	24 (17.0)	13 (15.1)	37 (16.3)
35-44	52 (36.9)	19 (22.1)	71 (31.3)
45-54	34 (24.1)	15 (17.4)	49 (21.6)
55-64	27 (19.1)	26 (30.2)	53 (23.3)
65+	4 (2.8)	13 (15.1)	17 (7.5)
Race			
White	125 (89.9)	71 (84.5)	196 (87.9)
Non-White	14 (10.1)	13 (15.5)	27 (12.1)
University Position			
Tenure-track Faculty	67 (47.9)	49 (59.0)	116 (52)
Non-tenure Track Faculty	38 (27.1)	17 (20.5)	55 (24.7)
Research Staff	26 (18.6)	7 (8.5)	33 (14.8)
Postdoctoral Researchers	9 (6.4)	10 (12.0)	19 (8.5)

Measures

Participants were asked to report research productivity outcomes (i.e., number of peer-reviewed publications submitted as the first author or coauthor, number of grant proposals submitted or resubmitted, and number of conferences attended in person or virtually) and the percentage of time allocated to childcare (average percent per week) during three periods of time: the year before the pandemic (i.e., March 2019-February 2020), the first year of the

pandemic (i.e., March 2020-February 2021), and the first eight months of the second year of the pandemic (i.e., March 2021-October 2021). Interview questions are presented below:

1. Please tell me about the biggest challenges you've faced regarding the COVID-19 pandemic.
2. Please describe the challenges of boundary management between work and home life due to COVID-19.
3. Are there dynamics in your department/program (before or during COVID-19) that pose a barrier to success?
4. What support could be provided from the university and/or your department/program?

Data Analysis Plan

Using SPSS, separate independent t-tests were performed to examine differences in key variables by gender and caregiving status at each time point. We also conducted separate repeated measures analyses of variance (ANOVAs) by gender and caregiving status to examine changes across the three time periods. There was not enough statistical power to conduct subsequent analyses by both gender and caregiving status (e.g., women with children compared to men without children), therefore, we present trends in participant research outcomes by gender and caregiving responsibilities. Chi-square tests of association were also performed to examine primary caregiving responsibilities at each time point.

We used Atlas.ti to organize and analyze qualitative data (Charmaz, 2005). Two members of the research team engaged in an iterative coding process, beginning with open-coding, and engaging in frequent discussions to identify emergent themes, and to create and refine codes. When a consensus was reached about a final coding scheme, researchers coded 15% of the transcripts to test inter-coder reliability, resulting in 94% agreement. The remaining transcripts were recoded according to the final codebook. Dichotomous variables were created for each code (1=coded, 0=not coded). We then compiled frequency counts to explore trends in qualitative data by gender, caregiving responsibilities, and research productivity. Qualitative quotes from participants are presented below to support the quantitative findings.

Results

Below, we present the quantitative and qualitative results, including participant quotes. The qualitative data provides insight into the nuances of the challenges reported by participants, particularly women and caregivers. The results are categorized into three sections: (1) Gender and productivity outcomes; (2) caregiving status and productivity outcomes; and (3) gender, caregiving status, and productivity outcomes.

Gender and Productivity Outcomes

Independent t-tests were calculated at each period (i.e., the year before and the first two years of the pandemic) to compare changes in research productivity outcomes by gender (see Table 2). Men reported having significantly more peer-reviewed publications than women in the year prior to the pandemic, $t(144)=-1.94$, $p<.05$, and year one of the pandemic, $t(145)=-2.06$, $p<.10$. There were no significant differences in grant proposal submissions or conference attendance during the year prior to the pandemic and the first two years of the pandemic. However, repeated measures ANOVAs revealed significant decreases over time for all research productivity outcomes. Both women and men reported decreases in their peer-reviewed publications, $F(2, 162)=5.08$, $p<.05$ and $F(2, 122)=11.15$, $p<.001$, grant proposal submissions, $F(2, 158)=5.43$, $p<.05$ and $F(2, 110)=5.70$, $p<.05$, and conference attendance, $F(2, 166)=23.40$, $p<.001$ and $F(2, 120)=15.37$, $p<.001$, respectively.

Qualitative data indicated that COVID-19 has exacerbated gender inequity in the workplace. Compared to men ($n=4$, 6.7%), women researchers ($n=16$, 17.2%) were more likely to cite gender inequities in their qualitative responses. For instance, one participant stated that "women were more impacted by COVID-19 than men… the gap between men and women faculty is going to get worse," adding, "we don't want to lose sight of this in a few years when there are more men being promoted than women" (full professor, woman with children). Another participant called attention to the impact of the pandemic on women, speculating that "there's going to be a lot fewer women professors" (research faculty, woman with children). One woman explained that "due to the productivity costs of the pandemic, I was not prepared to go up [for tenure] and will wait at least another year" (assistant professor, woman with children). Another participant explained the financial impact of

extending her tenure clock, stating that waiting "another year limits my ability for promotion and therefore the amount of increase in salary that comes along with promotion" (assistant professor, woman with children).

Caregiving Status and Productivity Outcomes

Half of the university faculty and staff participants had children aged 18 and under living at home (*n*=116, 51.6%). As shown in Table 2, independent t-tests revealed no significant differences in research productivity outcomes between caregivers and non-caregivers at each period (i.e., the year before and the first two years of the pandemic).

Table 2. Productivity outcomes by gender and caregiving status (N=178)

	Women (*n*=108)	Men (*n*=70)	***t***
	M (*SD*)	*M* (*SD*)	
Peer-reviewed Publications			
Pre-pandemic	2.5 (2.9)	3.5 (3.3)	-1.94*
Year 1	1.8 (2.4)	2.7 (2.9)	-2.06 ^{t}
Year 2	1.8 (2.7)	2.0 (2.5)	-0.65
F	5.08*	11.15***	
Grant Proposals Submitted			
Pre-pandemic	1.7 (2.8)	1.5 (1.9)	0.24
Year 1	1.3 (1.9)	1.4 (1.8)	0.87
Year 2	1.0 (1.5)	0.9 (1.4)	0.74
F	5.43*	5.70*	
Conferences Attended			
Pre-pandemic	2.3 (2.1)	2.2 (1.5)	0.48
Year 1	1.4 (1.6)	1.6 (1.6)	-0.51
Year 2	1.0 (1.3)	1.1 (1.3)	-0.35
F	23.40***	15.37***	
	Caregivers (*n*=116)	Non-caregivers (*n*=109)	***t***
	M (*SD*)	*M* (*SD*)	
Peer-reviewed Publications			
Pre-pandemic	1.7 (1.6)	1.3 (1.7)	1.04
Year 1	1.2 (1.4)	1.2 (1.5)	-0.06
Year 2	1.1 (1.4)	1.2 (1.7)	-0.30
F	9.19***	2.08	
Grant Proposals Submitted			
Pre-pandemic	1.7 (2.4)	1.5 (2.2)	0. 45
Year 1	1.4 (1.9)	1.7 (2.1)	-0.50
Year 2	1.00 (1.5)	1.2 (1.7)	-0.66
F	8.57***	2.61^{t}	
Conferences Attended			
Pre-pandemic	2.4 (1.9)	2.5 (2.1)	-0.17
Year 1	1.4 (1.7)	1.7 (1.4)	-0.78
Year 2	1.0 (1.3)	1.5 (1.3)	-2.00
F	28.85***	11.83***	
$p<.10^{t}$, $p<.05$*, $p<.01$**, $p<.001$***			

However, among caregivers, repeated measures ANOVAs revealed significant decreases in their peer-reviewed publications, $F(2, 150)=9.19$, $p<.001$, grant proposal submissions, $F(2, 144)=8.57$, $p<.001$, and conference attendance, $F(2, 152)=28.85$, $p<.001$, over time. Non-caregivers only reported significant decreases in the number of conferences attended, $F(2, 140)=11.83$, $p<.001$.

One of the most significant challenges expressed by caregivers was work-life imbalance, resulting from the abrupt transition to remote work while needing to provide care for children at home. For researchers with caregiving responsibilities, this transition came with the added demands to care for children, including constant interruptions during work hours (e.g., daycare or school closure due to COVID-19 exposure), remote learning, and other unanticipated challenges (e.g., transportation for children). Compared to men researchers with children (*n*=17, 65.4%), women researchers with children (*n*=42, 75.0%) were more likely to report work-life imbalance in their qualitative responses. As one women researcher explained, "children are present all the time, for an extended period of time, and trying to find a few hours to work was extremely difficult" (assistant professor, woman with children). Another participant stated that "during the initial shutdown period, I experienced heightened distractions while working from home, as I have a toddler son. These distractions decreased my overall work productivity" (assistant professor, man with children). Another man expressed:

> Our research community had no understanding what it was like to try and work at home with our kids doing school from home. It was insane and distracting. I had to come to the office or stay up late while they slept to get any real work done (*full professor, man with children*).

Another frequently cited challenge was the lack of childcare and support needed to care for children while working remotely. Women researchers with children were more likely to report caregiving challenges (*n*=44, 78.6%) and the lack of childcare support (*n*=15, 26.8%) as obstacles in their qualitative responses, compared to men researchers with children (n=16, 61.5% and *n*=1, 3.8%, respectively). For example, one participant stated that "the primary effect of the pandemic was a reduction in the amount of time I was able to devote to research. I had to assist my spouse in providing care for my 3 young children. This greatly reduced my productive research time" (assistant professor, man with children). Another participant explained that COVID-19 has had "a huge impact relative to my children…I have two middle school children with severe anxiety and other health issues" (full professor, man with children). Additionally, one participant stated:

> I lost access to childcare and so took over childcare and remote learning and still tried to do my job. I pivoted to hybrid teaching and created more than 100 video lectures. I lost my support system, including my spouse's support, to COVID-19-related barriers. I carry the emotional burden of caring for my colleagues and students in the classroom and the lab. I lost all time for creative research endeavors for more than a year. The lab was on life support. I didn't have access to childcare. I couldn't participate in my professional life outside of the bare minimum (*assistant professor, woman with children*).

Another participant explained:

> The biggest impact of COVID-19 has been the complete lack of childcare for my infant. I have been juggling my full-time position with being a full-time career for the baby while we wait for a spot for her at a daycare. At 10 months old, she has just started at a daycare for only 3 days a week, so I am still working while minding the baby for two days in the week. This has obviously prevented me from getting into the lab to perform research and I have barely any time to write up papers, or grants (*assistant professor, woman with children*).

Coordinating and supporting children's remote learning needs was also described as an additional barrier to focusing on work and research. For instance, one participant stated,

> These past 18–24 COVID-19 months have been the hardest of my career. Juggling work, teaching, remote learning for an elementary school child, plus the mental toll of being a human in the middle of a tragic global pandemic is insane (*assistant professor, woman with children*).

Another stated, "childcare and remote learning demands didn't help anything from a career and professional perspective" (*full professor, man with children*). Additionally, one participant

stated that "working from home included many more distractions, primarily childcare [and] children's education" (*associate professor, man with children*).

Gender, Caregiving Status, and Productivity Outcomes

As shown in Table 3, women were more likely to serve as the primary caregiver the year before the pandemic, $\chi^2(1)=17.76$, $p<.001$, $\Phi=.48$, year one, $\chi^2(1)=15.93$, $p<.001$, $\Phi=.45$, and year two of the pandemic, $\chi^2(1)=7.68$, $p<.05$, $\Phi=.31$. Repeated measures ANOVAs provide further insight into the time spent on childcare and research activities among caregivers. Both women and men with children reported significant changes in time spent on caregiving, $F(2, 86)=10.01$, $p<.001$ and $F(2, 44)=5.53$, $p<.05$, and research, $F(2, 86)=11.51$, $p<.001$ and $F(2, 48)=5.31$, $p<.05$, respectively. However, in the second year of the pandemic, men with children indicated spending a similar amount of time on childcare and a greater amount of time on research activities than pre-pandemic. Although there were some improvements among women with children, they reported spending significantly more time on childcare in year two than the year before the pandemic.

Table 3. Primary caregiver status and time spent on childcare by gender (N=82)

Primary Caregiving Status	Women with Children (*n*=56) *N* (%)	Men with Children (*n*=26) *N* (%)	χ^2
Pre-pandemic			
Self	20 (37.7)	4 (16.0)	17.76*** Φ=.48
Partner	2 (3.8)	10 (40.0)	
In-person school/ Childcare	24 (45.3)	8 (32.0)	
Other	7 (13.2)	3 (12.0)	
Year 1			
Self	36 (65.5)	5 (20.0)	15.93*** Φ=.45
Partner	5 (9.1)	9 (36.0)	
In-person school/ Childcare	5 (9.1)	3 (12.0)	
Other	9 (16.4)	8 (32.0)	
Year 2			
Self	23 (42.6)	5 (20.0)	7.68* Φ=.31
Partner	4 (7.4)	7 (28.0)	
In-person school/ Childcare	19 (35.2)	7 (28.0)	
Other	8 (14.8)	6 (24.0)	
% Time / Week Spent on Caregiving	Women with Children (*n*=56) *Mean %* (*SD*)	Men with Children (*n*=26) *Mean %* (*SD*)	***t***
Pre-pandemic	14.9 (11.0)	16.4 (13.2)	-0.50
Year 1	24.0 (16.3)	21.7 (16.0)	0.56
Year 2	21.16 (10.8)	17.3 (12.5)	0.99
F	10.01***	5.53*	
% Time / Week Spent on Research			
Pre-pandemic	57.9 (15.6)	55.8 (14.4)	0.57
Year 1	48.6 (16.8)	50.1 (17.5)	-0.36
Year 2	52.1 (13.7)	57.0 (15.9)	-0.54
F	11.51***	5.31*	
p<.05*, *p*<.001***			

Further, Table 4 presents trends in the data for productivity outcomes by gender and caregiving responsibilities. While all participants reported a decrease in peer-reviewed

publications during the pandemic, these decreases were substantially greater for caregivers than for non-caregivers. The number of grant proposals submitted also decreased for all participants except men without children living at home, who reported an increase in the number of proposals submitted during the pandemic. The number of conferences attended also decreased during the pandemic, however, these decreases were substantially greater for caregivers than for non-caregivers.

Table 4. Productivity outcomes by gender and caregiving status (N=153)

	Women with Children (*n*=56)	Men with Children (*n*=26)	Women with No Children (*n*=37)	Men with No Children (*n*=34)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Peer-reviewed Publications				
Pre-pandemic	2.9 (3.2)	3.7 (2.4)	2.0 (2.4)	3.3 (3.8)
Year 1	2.2 (2.8)	2.5 (2.2)	1.3 (1.3)	2.9 (3.4)
Year 2	2.0 (3.2)	2.1 (2.2)	1.3 (1.7)	2.0 (2.7)
Grant Proposals Submitted				
Pre-pandemic	1.9 (2.7)	1.4 (1.6)	1.3 (2.9)	1.5 (2.2)
Year 1	1.6 (2.2)	1.1 (1.5)	1.0 (1.3)	1.6 (2.1)
Year 2	1.1 (1.5)	0.7 (1.3)	0.9 (1.5)	1.0 (1.5)
Conferences Attended				
Pre-pandemic	2.4 (2.0)	2.5 (1.5)	2.2 (2.1)	1.9 (1.5)
Year 1	1.3 (1.7)	1.7 (1.8)	1.7 (1.3)	1.4 (1.5)
Year 2	0.9 (1.2)	1.1 (1.4)	1.2 (1.5)	1.1 (1.3)

The trends from the quantitative data are supported by challenges and disparities identified by participants in the qualitative responses. Several participants specifically called attention to the gender inequities of caregiving. For instance, one participant explained, "expectations are much higher for care work for women faculty" (assistant professor, woman with children), while another stated that "COVID-19 disproportionately affected women with children under five" (assistant professor, woman with children). Additionally, one woman stated that "parents and women have to defend the situation we are in due to the pandemic," suggesting that people who "don't have small children don't seem to grasp the struggles" (*lecturer, woman with children*).

Women with children (*n*=38, 67.9%) were more likely to call attention to the cumulative impact of the pandemic, specifically caregiving, on their long-term career trajectory, compared to men caregivers (*n*=11, 42.3%) and women (*n*=16, 43.2%) and men without children living at home (*n*=16, 47.1%). For instance, one woman stated:

> The reality is that my resume is absolutely impacted by COVID-19. Eventually, my CV will be compared to my counterparts that are not mothers, wives, etc., and my resume will not be as good as theirs because I had a year where my priorities had to change, a lot. Having two children - very young children - as a tenure-track professor is difficult. Having two very young children as a tenure-track professor during a pandemic, with no family or childcare, was damn near impossible (*assistant professor, woman with children*).

Another participant explained:

> My productivity - producing papers, writing successful proposals, earning the recognition of my peers - has dropped significantly and I fall further behind every day, albeit at a slower pace than during the worst of the pandemic when schools and daycares were closed. There is no clear path forward to ever catching up (research faculty, woman with children).

Further, one man stated that "childcare responsibilities increased, and I refused to sacrifice my children's well-being for my career" (*associate professor, man with children*). Another expressed:

> I would like there to be some understanding for the fact that my sabbatical, like many other women, was entirely given over to childcare… The result has been that I have essentially lost my sabbatical. This time was set aside to work on book revisions, but I was unable to finish due to my limited research time. I am about a year behind on my research at this point and it's not clear to me that I will ever catch up or recover (*associate professor*, *woman with children*).

Another woman stated:

> COVID-19 has meant working harder and more stress…My reduced work hours and reduced attention while needing to care for my child makes me look bad to colleagues, who don't have to balance work with childcare (professional, administrative, and technical staff, woman with children).

Participants also called attention to the importance of noting the impact of the pandemic on women with children. Specifically, one participant stated that "it's important to document the effect of COVID-19 on research productivity of young, pre-tenured professors, women with children - those who have been disproportionately impacted by COVID-19" (*assistant professor, woman with children*). Another woman noted:

> The productivity divide between those with caregiving responsibilities (children, eldercare) and those without is a deep chasm. I saw some colleagues' productivity skyrocket during COVID-19 while I struggled to complete the most basic tasks of writing an email without being interrupted by my kindergartner or toddler (research faculty, woman with children).

Additionally, several participants, particularly men, noted the gendered nature of caregiving responsibilities and the subsequent impact on research productivity. For instance, one participant expressed that:

> My wife has suffered the most, having taken on much of the remote learning throughout the pandemic and trying to work as if nothing had changed. Her work demands were not diminished even when she went down to part time (full professor, man with children).

Another participant explained:

> I look around and see colleagues struggling and others who are doing well, and there's a definite mismatch between who is doing well versus who is not. Those who are struggling more are my younger, woman colleagues with small children, who are less firmly established in their careers (research faculty, woman without children).

Another participant noted, "I have women colleagues at the university, in their early careers who have young kids, and I worry about them. I try to make sure they can manage their situation and be flexible with their needs" (associate professor, man without children). Another stated that "COVID-19 had a minimal direct effect on my work. However, other members of my research team have small children, and this had a huge impact on them and their careers" (research faculty, man without children).

In addition, participants called attention to the ongoing needs of caregivers. Specifically, several parents cited that they are still struggling, while normal operations seem to have resumed for their colleagues without children. This is particularly important as COVID-19 vaccinations were slow to be approved for use in children under the age of five and there are continued challenges relating to in-person schooling. Compared to men researchers with children (*n*=2, 7.7%), women researchers with children (*n*=17, 30.4%) were more likely to recognize ongoing childcare concerns in their qualitative responses. For instance, one woman stated, "even though the university has resumed normal operations, childcare and schooling has not resumed, so barriers are still there" (research faculty, woman with children). Another stated, "even now, every two weeks I have to be home with a kid with sniffles" (assistant professor, woman with children). Additionally, one participant explained:

> Even when we regained childcare in Fall 2021, it has been unreliable at times because of COVID-19 disruptions - sending our child home because of COVID-like symptoms and requiring a negative test to return (assistant professor, man with children).

Participants also shared how ongoing childcare demands continued to impact their research productivity. For instance, one participant stated:

> There is a continuing ripple effect on my research productivity. Even now, my kids are 'back' in school, but the pandemic has reduced the number of bus drivers, so we have to do more driving of kids than ever before. They are both not old enough to get vaccinated and the schools have had rolling quarantines of exposure, so it is likely a matter of time before we will have them home for 10-14 days for such quarantines (full professor, woman with children).

Interestingly, several men, specifically men without children, indicated no change on their research productivity or career as a result of COVID-19.. For example, when asked about the impact of the pandemic on their career trajectory, one participant stated that "nothing really changed" (research faculty, man with children), while another stated that there was "no impact" (full professor, man with children). Another participant expressed that his career "trajectory remained more or less the same" and that he "got a couple of proposals funded during this time" (associate professor, man without children). On participant stated that, "while face-to-face work has been totally interrupted and missed, I was able to maintain all aspects of my work" (professional, administrative, and technical staff, man without children). A few others reported improvements to their research productivity during the pandemic. For instance, one participant stated,

> Working from home, it's more productive for me. I don't need to drive to work, find a parking spot, worry about clothing in the morning. [I] just wake up, brew a coffee, and start at 6:30-7:00 (research faculty, man without children).

Another participant stated that, "overall the pandemic was good for me to deal with work [and] manuscripts" (postdoctoral researcher, man without children).

Discussion

The COVID-19 pandemic resulted in career and economic disruptions that impacted academic researchers around the U.S. (National Academies of Sciences, Engineering, & Medicine, 2021). Recent reports show that many of these challenges are still ongoing for working parents (Gawlik & Melnyk, 2022; Pearson, 2022). Utilizing quantitative and qualitative data from faculty and staff engaged in research at a Carnegie Classification R1 University, our paper illustrates how the COVID-19 pandemic exacerbated existing gender inequities in caregiving responsibilities and research productivity.

Our first research question examined the relationship between gender and productivity, both before and during the pandemic. Consist with the existing literature, our findings showed that men reported having significantly more peer-reviewed publications than women the year prior to (Astegiano *et al*., 2019; Burstin & Arora, 2021; Mayer *et al*., 2017) and during the pandemic (Anderson *et al*., 2020; Feng & Savani, 2020; Kitchener, 2020; Ribarovska *et al*., 2021). Although there were no significant gender differences in the number of grant proposal submissions, women reported a substantial decrease from the year before to year two of the pandemic. Further, due to mandatory closures of physical facilities, it makes sense that both men and women reported reduced conference attendance during the pandemic.

Second, we examined the relationship between caregiving responsibilities and productivity, before and during COVID-19. We found that caregivers reported significant decreases in all research productivity outcomes (i.e., peer-reviewed publications, grant proposal submissions, and conference attendance), while non-caregivers only reported significant decreases in the number of conferences attended. Although this finding mirrors research on the impact of caregiving during the pandemic (Collins *et al*., 2021; Cui *et al*., 2021; Dang & Nguyen 2021; Dias *et al*., 2020), our qualitative data provide further insight into the types of challenges faced by parents. Further, results suggest that for many caregivers, pandemic-related challenges are ongoing (Gawlik & Melnyk, 2022; Pearson, 2022).

Finally, we examined the intersection of gender, researcher productivity, and caregiving status. Our findings echo recent research suggesting that women were primarily responsible for caregiving during the pandemic (Dunatchik *et al*., 2021; Johnston *et al*., 2020; Power, 2020; Yildirim & Eslen-Ziya, 2021). Although not explicitly asked about in this study, during interviews, women participants highlighted the demands and time-consuming nature of remote schooling for school-aged children. These findings are supported by prior research showing that woman disproportionately shouldered the responsibility for remote schooling (Craig & Churchill, 2021; Delaney *et al*., 2021; Feng & Savani, 2020; Hjálmsdóttir & Bjarnadóttir, 2021).

Our results also detail how the strain of increased caregiving responsibilities impacted research productivity, most noticeably for women with children. Consistent with prior research, quantitative data revealed shifts in productivity outcomes by gender and caregiving responsibilities (Collins *et al*., 2021; Cui *et al*., 2021; Dang & Nguyen 2021; Dias *et al*., 2020). While almost all participants reported disruptions to their research productivity resulting from the pandemic, our qualitative data showed that women with caregiving responsibilities reported the most pronounced experiences of overwhelm. Although productivity began to rebound in the second year of the pandemic, more than half of women with children noted the cumulative impact of productivity losses due to caregiving responsibilities on their future career trajectories, including promotions, leadership responsibilities and job security, and future financial earnings.

Given that care responsibilities were noted as reasons for leaving the field or "pipeline" prior to the pandemic (Ferri *et al*., 2016), it is important for universities to make systemic changes that mitigate productivity losses and promote the retention of women researchers with children. For instance, some recommendations highlight the need for institutional flexibility to account for the needs of faculty who are caregivers (Oleschuck, 2020). Others have suggested formally waiving service responsibilities for caregivers (Settles & Linderman, 2020) and adding COVID-19 impact statements to provide space for faculty to detail how their work was impacted by the pandemic, particularly balancing caregiving responsibilities (Oleschuck, 2020). Although many universities have provided tenure clock extensions, these have significant negative impacts on women and reduce long-term earning potential and promotional opportunities (Malisch *et al*., 2020). Further, universities need to provide clear guidance on how research faculty and staff should quantify the impacts of COVID-19 on their research, teaching, and service activities (e.g., tangible benchmarks). While many institutions have encouraged a community response to support faculty with children (e.g., providing guest lectures, reducing service work requirements), it is increasingly important to identify and advance formal support systems within departments to mitigate the impacts of faculty with caregiving demands (Oleschuck, 2020).

Limitations and Conclusion

Although our sample was reflective of the population of faculty and staff engaged in research at one public university, the heterogeneity of the sample (i.e., race and status) is one of the main limitations of this study. More data is needed to accurately portray the impact of the COVID-19 pandemic on non-white women and women from different socioeconomic backgrounds. Further, due to the small number of transgender participations and participants who reported a non-heterosexual sexual identity, we were unable to analyze our data related to lesbian, gay, bisexual, transgender, or queer participants. Our sample also included a smaller percentage of men compared to non-respondents (i.e., faculty and staff who were invited but did not participate). Given than some men reported increased productivity during the pandemic (consistent with findings from Lee *et al*., 2023), future efforts should ensure more representative samples of men and women. Future research with more diverse populations is needed to examine differences among racial and sexual minority researchers, as well as the impact of intersecting structural inequities (see Laster Pirtle & Write, 2021 for a discussion on structural gendered racism as it relates to COVID-19).

In addition, this paper utilized data collected in October of 2021, which only measured the first eight months of the second year of the pandemic. Additional research, including longitudinal studies, is needed to capture the full extent and continued impact of COVID-19 on women with children who are research faculty and staff. Research assessing the long-term impacts of COVID-19 for women and caregivers will provide a comprehensive picture of the relationship between gender inequity, division of labor, and events that cause widespread social and economic disruption. Lastly, this study did not examine other types of caregiving responsibilities (e.g., eldercare). Given that daughters are more likely to care for aging relatives than sons (Abrahamsen & Grøtting, 2023; Chu, 2021), additional research is needed on the impact of the pandemic on women who were primarily responsible for both child- and eldercare. Our findings suggest that existing gendered inequities were exacerbated by the COVID-19 pandemic. The results mirror previous research on the relationship between gender and caregiving responsibilities, and the subsequent differential impacts on research productivity during the pandemic. Our study highlights the need to provide institutional support for women researchers with children and to find solutions that mitigate their productivity losses and facilitate success in their future career endeavors.

References

Abrahamsen, S. A., & Grøtting, M. W. (2023). Formal care of the elderly and health outcomes among adult daughters. *Health Economics, 32*(2), 436–461.

Acker, J. (1990). Hierarchies, jobs, bodies: A theory of gendered organizations. *Gender & society, 4*(2), 139–158.

Alper, J. (1993). The pipeline is leaking women all the way along. *Science, 260*(5106), 409–411.

Andersen, J. P., Nielsen, M. W., Simone, N. L., Lewiss, R. E., & Jagsi, R. (2020). Meta-research: Is Covid-19 amplifying the authorship gender gap in the medical literature? *arXiv*, 1–12. https://doi.org/10.48550/arXiv.2005.06303

Allen, K. A., Butler-Henderson, K., Reupert, A., Longmuir, F., Finefter-Rosenbluh, I., Berger, E., Grove, C., Heffernan, A., Freeman, N., Kewalramani, S., Krebs, S., & Fleer, M. (2021). Work like a girl: Redressing gender inequity in academia through systemic solutions. *Journal of University Teaching & Learning Practice, 18*(3), 1–18. https://doi.org/10.53761/1.18.3.3

Astegiano, J., Sebastián-González, E., & Castanho, C. D. T. (2019). Unravelling the gender productivity gap in science: A meta-analytical review. *Royal Society Open Science, 6*(6), 1-12. https://doi.org/10.1098/rsos.181566

Berryman, S. E. (1983). *Who will do science? Trends, and their causes in minority and women representation among holders of advanced degrees in science and mathematics*. A Special Report.

Bianchi, S. M., Milkie, M. A., Sayer, L. C., & Robinson, J. P. (2000). Is anyone doing the housework? Trends in the gender division of household labor. *Social Forces, 79*(1), 191–228. https://doi.org/10.1093/sf/79.1.191

Bird, S. R., Litt, J., & Wang, Y. (2004). Creating a status of women report: Institutional housekeeping as women's work. *National Women's Studies Association Journal, 16*, 194–206. http://www.jstor.org/stable/4317042

Bishu, S. G., & Alkadry, M. G. (2017). A systematic review of the gender pay gap and factors that predict it. *Administration & Society, 49*(1), 65–104. https://doi.org/10.1177/0095399716636928

Blau, F. D., & Kahn, L. M. (2020). *The gender pay gap: Have women gone as far as they can? In Inequality in the United States: A Reader* (pp. 345–362). Routledge.

Braun, M., Lewin-Epstein, N., Stier, H., & Baumgärtner, M. K. (2008). Perceived equity in the gendered division of household labor. *Journal of Marriage and Family, 70*(5), 1145–1156. https://doi.org/10.1111/j.1741-3737.2008.00556.x

Burstin, H. R., & Arora, V. M. (2021). Gender disparities in journal citations—Another metric of inequity in academia. *JAMA Network Open, 4(*7), e2114787–e2114787. https://doi.org/10.1001/jamanetworkopen.2021.14787

Cardel, M. I., Dhurandhar, E., Yarar-Fisher, C., Foster, M., Hidalgo, B., McClure, L. A., Pagoto, S., Brown, N., Pekmezi, D., Sharafeldin, N. Willig, A., & Angelini, C. (2020). Turning chutes into ladders for women faculty: A review and roadmap for equity in academia. *Journal of Women's Health, 29*(5), 721–733. https://doi.org/10.1089/jwh.2019.8027

Casad, B. J., Franks, J. E., Garasky, C. E., Kittleman, M. M., Roesler, A. C., Hall, D. Y., & Petzel, Z. W. (2021). Gender inequality in academia: Problems and solutions for women faculty in STEM. *Journal of Neuroscience Research, 99*(1), 13–23. https://doi.org/10.1002/jnr.24631

Charmaz, K. (2005). Grounded theory in the 21st century. In N. K. Denzin and Y. S. Lincoln (eds.), *The SAGE handbook of qualitative research* (pp. 507–535). Sage Publications.

Chawla, N., Wong, E. M., & Gabriel, A. S. (2019). Expanding the discourse surrounding sexual harassment: The case for considering experienced and observed hostile sexism, benevolent sexism, and gendered incivility. *Industrial and Organizational Psychology,12*(1), 79–83. https://doi.org/10.1017/iop.2019.13

Chu, S. (2021, December). *Caring for elderly parents: The role of daughters. In 2021 4th International Conference on Humanities Education and Social Sciences (ICHESS 2021)* (pp. 324–330). Atlantis Press.

Ciciolla, L., & Luthar, S. S. (2019). Invisible household labor and ramifications for adjustment: *Mothers as captains of households. Sex Roles, 81*(7), 467–486. https://doi.org/10.1007/s11199-018-1001-x

Cimpian, J. R., Kim, T. H., & McDermott, Z. T. (2020). Understanding persistent gender gaps in STEM. *Science, 368*(6497), 1317–1319.

Cohen, S. A., Sabik, N. J., Cook, S. K., Azzoli, A. B., & Mendez-Luck, C. A. (2019). Differences within differences: Gender inequalities in caregiving intensity vary by race and ethnicity in informal caregivers. *Journal of Cross-Cultural Gerontology, 34*(3), 245–263. https://doi.org/10.1007/s10823-019-09381-9

Colby, G., & Fowler, C. (2020). *Data snapshot: IPEDS data on full-time women faculty and faculty of color. American Association of University Professors.* https://www.aaup.org/sites/default/files/Dec-2020_Data_Snapshot_Women_and_Faculty_of_Color.pdf

Collins, C., Landivar, L. C., Ruppanner, L., & Scarborough, W. J. (2021). COVID-19 and the gender gap in work hours. *Gender, Work & Organization, 28*, 101–112. https://doi.org/10.1111/gwao.12506

Craig, L., & Churchill, B. (2021). Dual-earner parent couples' work and care during COVID-19. *Gender, Work & Organization, 28*, 66–79. https://doi.org/10.1111/gwao.12497

Cui, R., Ding, H., & Zhu, F. (2022). Gender inequality in research productivity during the COVID-19 pandemic. *Manufacturing & Service Operations Management, 24*(2), 707–726. https://doi.org/10.1287/msom.2021.0991

Dang, H. A. H., & Nguyen, C. V. (2021). Gender inequality during the COVID-19 pandemic: Income, expenditure, savings, and job loss. *World Development, 140*, 105296–105306. https://doi.org/10.1016/j.worlddev.2020.105296

Del Boca, D., Oggero, N., Profeta, P., & Rossi, M. (2020). Women's and men's work, housework and childcare, before and during COVID-19. *Review of Economics of the Household, 18(*4), 1001–1017. https://doi.org/10.1007/s11150-020-09502-1

Delaney, R. K., Locke, A., Pershing, M. L., Geist, C., Clouse, E., Debbink, M. P., Haaland, B., Tanner, A.J., Anzai, Y., & Fagerlin, A. (2021). Experiences of a health system's faculty, staff, and trainees' career development, work culture, and childcare needs during the COVID-19 pandemic. *JAMA Network Open, 4*(4), e213997–e213997. https://doi.org/10.1001/jamanetworkopen.2021.3997

Dias, F. A., Chance, J., & Buchanan, A. (2020). The motherhood penalty and the fatherhood premium in employment during covid-19: Evidence from the United States. *Research in Social Stratification and Mobility, 69*, 100542–100552. https://doi.org/10.1016/j.rssm.2020.100542

Dönmez, P. E. (2022). The COVID-19 pandemic, academia, gender, and beyond: A review. *MDPI Publications, 10*(3), 30–43. https://doi.org/10.3390/publications10030030

Dunatchik, A., Gerson, K., Glass, J., Jacobs, J. A., & Stritzel, H. (2021). Gender, parenting, and the rise of remote work during the pandemic: Implications for domestic inequality in the United States. *Gender & Society, 35*(2), 194–205. https://doi.org/10.1177/08912432211001301

Else, H. (2018). Does science have a bullying problem? *Nature, 563*(7733), 616–618.

Fairchild, A. L., Holyfield, L. J., & Byington, C.L. (2018). National Academies of Sciences, Engineering, and Medicine report on sexual harassment: Making the case for fundamental institutional change. *JAMA, 320*(9), 873–874. https://doi.org/10.1001/jama.2018.10840

Feng, Z., & Savani, K. (2020). Covid-19 created a gender gap in perceived work productivity and job satisfaction: Implications for dual-career parents working from home. *Gender in Management, 35*(7/8), 719–736. https://doi.org/10.1108/GM-07-2020-0202

Ferri, D., Bozzon, R., & Murgia, A. (2016). *Experiences of early career researchers/academics: A qualitative research on the leaky pipeline and interrelated phenomena in six European countries* (pp. 12–66). GARCIA Working Papers.

Frank, E., Zhao, Z., Fang, Y., Rotenstein, L. S., Sen, S., & Guille, C. (2021). Experiences of work-family conflict and mental health symptoms by gender among physician parents during the COVID-19 pandemic. *JAMA Network Open, 4*(11), e2134315. https://doing.org/10.1001/jamanetworkopen.2021.34315

Gawlik, K., & Melnyk, B. M. (2022). *Pandemic parenting: Examining the epidemic of working parental burnout and strategies to help. The Ohio State University*. https://wellness.osu.edu/sites/default/files/documents/2022/05/OCWO_ParentalBurnout_3674200_Report_FINAL.pdf

Gerstel, N., & Gallagher, S. K. (2001). Men's caregiving: Gender and the contingent character of care. *Gender & Society, 15*(2), 197–217. https://doi.org/10.1177/089124301015002003

Gregor, M., Dunn, M., Campbell-Halfaker, D., Martin-Fernandez, J., Ferrer, A., & Robinson, S. (2023). Plugging the leaky pipeline: A qualitative investigation of untenured women faculty in STEM. *Journal of Career Development, 50*(2), 425–444. https://doi.org/08948453221101588

Guarino, C. M., & Borden, V. M. (2017). Faculty service loads and gender: Are women taking care of the academic family? *Research in Higher Education, 58*(6), 672–694. https://doi.org/10.1007/s11162-017-9454-2

Hirshfield, L. E., & Joseph, T. D. (2012). "We need a woman, we need a black woman": Gender, race, and identity taxation in the academy. *Gender & Education, 24*(2), 213–227. https://doi.org/10.1080/09540253.2011.606208

Hjálmsdóttir, A., & Bjarnadóttir, V. S. (2021). "I have turned into a foreman here at home": Families and work–life balance in times of COVID-19 in a gender equality paradise. *Gender, Work & Organization, 28*(1), 268–283. https://doi.org/10.1111/gwao.12552

Johnston, R. M., Mohammed, A., & Van Der Linden, C. (2020). Evidence of exacerbated gender inequality in child care obligations in Canada and Australia during the COVID-19 pandemic. *Politics & Gender, 16*(4), 1131–1141. https://doi.org/10.1017/S1743923X20000574

Kabat-Farr, D., & Cortina, L. M. (2014). Sex-based harassment in employment: New insights into gender and context. *Law and Human Behavior, 38*(1), 58–72. https://doi.org/10.1037/lhb0000045

Kerr, M. L., Rasmussen, H. F., Fanning, K. A., & Braaten, S. M. (2021). Parenting during COVID-19: A study of parents' experiences across gender and income levels. *Family Relations, 70*(5), 1327–1342. https://doi.org/10.1111/fare.12571

Kitchener, C. (2020). *Women academics seem to be submitting fewer papers during coronavirus: "Never seen anything like it" says one editor.* The Lily. https://www.thelily.com/women-academics-seem-to-be-submitting-fewer-papers-during-coronavirus-never-seen-anything-like-it-says-one-editor/

Landivar, L. C., Ruppanner, L., Scarborough, W. J., & Collins, C. (2020). Early signs indicate that COVID-19 is exacerbating gender inequality in the labor force. *Socius, 6*, 1–3. https://doi.org/10.1177/2378023120947997

Laster Pirtle, W. N., & Wright, T. (2021). Structural gendered racism revealed in pandemic times: Intersectional approaches to understanding race and gender health inequities in COVID-19*. Gender & Society, 35*(2), 168–179. https://doi.org/10.1177/08912432211001302

Lee, K. G., Mennerat, A., Lukas, D., Dugdale, H. L., & Culina, A. (2023). The effect of the COVID-19 pandemic on the gender gap in research productivity within academia. *Elife, 12*, e85427.

Malisch, J. L., Harris, B. N., Sherrer, S. M., Lewis, K. A., Shepherd, S. L., McCarthy, P. C., Spott, J. L., Karam, E. P., Moustaid-Moussa, N., Calarco, J. M., Ramalingam, L., Talley, A. E., Canas-Carrel, J. E., Ardon-Dryer, K., Weiser, D. A., Bernal, X. E., & Deitloff, J. (2020). In the wake of COVID-19, academia needs new solutions to ensure gender equity. *Proceedings of the National Academy of Sciences, 117*(27), 15378–15381. https://doi.org/10.1073/pnas.2010636117

Mayer, E. N., Lenherr, S. M., Hanson, H. A., Jessop, T. C., & Lowrance, W. T. (2017). Gender differences in publication productivity among academic urologists in the United States. *Urology, 103,* 39–46. https://doi.org/10.1016/j.urology.2016.12.064

Metcalf, H. (2010). Stuck in the pipeline: A critical review of STEM workforce literature. *InterActions: UCLA Journal of Education and Information Studies, 6*(2).

Misra, J., Lundquist, J. H., Holmes, E., Agiomavritis, S. (2011). *The ivory ceiling of service work*. American Association of University Professors. https://www.aaup.org/article/ivory-ceiling-service-work#.XxdWQp5Kg2w.

Murphy, M., Callander, J. K., Dohan, D., & Grandis, J. R. (2022). Networking practices and gender inequities in academic medicine: Women's and men's perspectives. *eClinicalMedicine, 45*, 101338–101348. https://doi.org/10.1016/j.eclinm.2022.101338

National Academies of Sciences, Engineering, and Medicine. (2021). *The impact of COVID-19 on the careers of women in academic sciences, engineering, and medicine.* The National Academies Press. https://doi.org/10.17226/26061

Oleschuk, M. (2020). Gender equity considerations for tenure and promotion during COVID-19. Canadian Review of Sociology, 57(3), 502–515. https://doi.org/10.1111/cars.12295

Oliker, S. (2011). Sociology and studies of gender, caregiving, and inequality. *Sociology Compass, 5*(11), 968–983. https://doi.org/10.1111/j.1751-9020.2011.00417.x

Pearson, C. (2022). *How working parents can spot signs of burnout.* New York Times. https://www.nytimes.com/2022/05/05/well/family/parental-burnout-symptoms.html

Power, K. (2020). The COVID-19 pandemic has increased the care burden of women and families. Sustainability: *Science, Practice and Policy, 16*(1), 67–73. https://doi.org/10.1080/15487733.2020.1776561

Pyke, K. (2011). Service and gender inequity among faculty. *PS: Political Science & Politics, 44*(1), 85–87. https://doi.org/10.1017/S1049096510001927

Pyke, K. (2014). Faculty gender inequity and the "just say no to service" fairy tale. In K. De Welde and A. Stepnick (eds.), *Disrupting the culture of silence: Confronting gender inequality and making change in higher education* (pp. 83–95). Stylus Publishing.

Raabe, I. J., Boda, Z., & Stadtfeld, C. (2019). The social pipeline: How friend influence and peer exposure widen the STEM gender gap. *Sociology of Education, 92*(2), 105–123.

Revenson, T. A., Griva, K., Luszczynska, A., Morrison, V., Panagopoulou, E., Vilchinsky, N., & Hagedoorn, M. (2016). Gender and caregiving: The costs of caregiving for women. In T.A. Revenson, K. Griva, A. Luszczynska, V. Morrison, E. Panagopoulou, N. Vilchinsky, & M. Hagedoorn (eds.), *Caregiving in the illness context* (pp. 48–63). Palgrave Pivot, London.

Ribarovska, A. K., Hutchinson, M. R., Pittman, Q. J., Pariante, C., & Spencer, S. J. (2021). Gender inequality in publishing during the COVID-19 pandemic. *Brain, Behavior, and Immunity, 91*, 1–3. https://doi.org/10.1016%2Fj.bbi.2020.11.022

Settles, I. H., & Linderman, J. (2020). *Faculty equity and COVID-19: The problem, the evidence, and recommendations.* University of Michigan ADVANCE Program.

Skrentny, J. D., & Lewis, K. (2022). Beyond the "STEM pipeline": Expertise, careers, and lifelong learning. *Minerva, 60*(1), 1–28.

Stamarski, C. S., & Son Hing, L. S. (2015). Gender inequalities in the workplace: The effects of organizational structures, processes, practices, and decision makers' sexism. *Frontiers in Psychology, 6*, 1–20. https://doi.org/10.3389/fpsyg.2015.01400

Squazzoni, F., Bravo, G., Grimaldo, F., García-Costa, D., Farjam, M., & Mehmani, B. (2021). Gender gap in journal submissions and peer review during the first wave of the COVID-19 pandemic: A study on 2329 Elsevier journals. *PloS One, 16*(10), 1–17. https://doi.org/10.1371/journal.pone.0257919

Tricco, A. C., Lachance, C. C., Rios, P., Darvesh, N., Antony, J., Radhakrishnan, A., Anand, S. S., et al. (2020). Global evidence of gender inequity in academic health research: A living scoping review protocol. *JBI Evidence Synthesis, 18*(10), 2181–2193. https://doi.org/10.11124/JBIES-20-00078

Woitowich, N. C., Jain, S., Arora, V. M., & Joffe, H. (2021). COVID-19 threatens progress toward gender equity within academic medicine. *Academic Medicine, 96*(6), 813–816. https://doi.org/10.1097%2FACM.0000000000003782

Yildirim, T. M., & Eslen-Ziya, H. (2021). The differential impact of COVID-19 on the work conditions of women and men academics during the lockdown. *Gender, Work & Organization, 28*, 243–249. https://doi.org/10.1111/gwao.12529