

# Work, Parenting, and Well-being

## An International Survey of Neurologists During the COVID-19 Pandemic

Myriam Abdennadher, MD\*, Sima Patel, MD\*, Kate Dembny, BS, BA, Roya Edalatpour, MD, Janice Weinberg, ScD, Luca Bartolini, MD, Aravind Ganesh, MD, DPhil†, and Divya Singhal, MD†

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**Correspondence**  
Dr. Abdennadher  
myrnader@gmail.com

### Abstract

#### Background and Objectives

COVID-19 reframed the relationship between work and home and, in general, made both more difficult—especially for parents. We hypothesized that, among neurologists, the effects of the pandemic on productivity and on well-being would be greater on those with children than on those without children and that the effects would be greater on women with children than on men with children.

#### Methods

We conducted an international electronic survey launched by the Practice Current section of the American Academy of Neurology. The survey included questions on demographics (self-identified gender, number of children and elderly dependents, childcare support, and country and state when applicable), workflow changes because of COVID-19, impacted domains, and productivity and well-being using the Likert scale. Counts are presented as descriptive statistics. Statistical analysis was performed using Mann-Whitney *U* and Kruskal-Wallis tests.

#### Results

We collected 243 fully completed surveys from providers in all continents with high representation of the United States (76%), providers who identified as women (71.6%), and neurologists with children (91%) among respondents. A majority worked remotely (28% fully, 43% mix). Neurologists reported decreased academic productivity (72%), work benefits (65%), and time for writing (48%). These findings were more prominent in respondents with children and among women practicing outside of the United States. Increased pressure from productivity expectations and lack of time for family were reported by 47% and 41% of respondents, respectively.

#### Discussion

The disruption from the COVID-19 pandemic affected academic productivity and decreased the well-being of neurologists in general and of neurologists with children more drastically. This could potentially hinder the promotion and retention of junior neurologists who were juggling life and work during the pandemic outbreak and its recurrent surges.

### Introduction

The arrival of the COVID-19 crisis set societies scrambling to understand risks and to mitigate them, and it is difficult to understate this crisis' effect on economic activity, on personal lives, and on professional development. It is imperative to try to understand these effects, because

\*These authors contributed equally as co-first authors.

†These authors contributed equally as co-senior author.

Department of Neurology (MA, RE), Boston University School of Medicine; Boston Medical Center, MA; Department of Neurology (SP, KD), University of Minnesota Medical School, Minneapolis; Department of Neurology (RE), University of Texas at Austin Dell Medical School; Boston University School of Public Health (JW), MA; Division of Pediatric Neurology (LB), Hasbro Children's Hospital, The Warren Alpert Medical School of Brown University, Providence, RI; Departments of Clinical Neurosciences and Community Health Sciences (AG), and the Hotchkiss Brain Institute, University of Calgary Cumming School of Medicine, Alberta, Canada; and Department of Neurology (DS), University of Texas at San Antonio, TX.

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COVID-19 will not be the last worldwide health crisis, and the lessons we draw from it will likely apply in the future.

During the early crisis, childcare services largely disappeared; this greatly affected the ability of working parents to perform professional activities. Working parents are a major part of the labor force, and more than two-thirds of US families and one-third of European families have at least one working parent.<sup>1,2</sup> As the crisis reshaped work and home lives, it exacerbated preexisting gender inequities: Stereotypical gender roles disproportionately shifted increased childcare and domestic work needs onto women.<sup>3-5</sup> In turn, academic productivity decreased more for women than for men, with lower percentages of first author publications and academic representation.<sup>5-8</sup> This could presumably aggravate inequities in physician salaries and career advancements.

The immediate effect of the COVID-19 crisis on childcare and domestic responsibilities for parent clinicians was substantial. For parent clinicians, academic and clinical productivity was acutely affected; however, the intermediate process is opaque and warrants further consideration. To further understand this relationship, a focus group at the AAN of neurologists from different academic centers in North America (the United States, Canada) was formed to undertake a survey of neurologists practicing in the United States and worldwide, to identify gender-specific trends related to lockdowns, social distancing measures, employer support for childcare, academic productivity, and personal well-being. The focus of this survey is to identify the effect of the early COVID-19 crisis (from February to June 2020) on neurology providers (physicians, advanced practice providers, residents, and fellows); it tests the supposition that the crisis had a disparate effect on the professional development and wellness of all providers with young children in general and of women with young children more specifically.

## Methods

### Study Design

We conducted an electronic survey from June 23, 2020, to June 16, 2021. The survey was launched by the Practice Current section of the American Academy of Neurology (AAN) ([neurology.org/collection/practicecurrent](https://neurology.org/collection/practicecurrent)) and was posted on the AAN website, available to a neurology provider audience including AAN members and non-members internationally. We acknowledge that the respondents represent a convenience sample of persons who had access to the AAN website and could respond to the survey. Practice Current surveys use deidentified data; it was, therefore, granted exemption by the Children's National Institutional Board Review.

### Population

Neurology providers, including neurology physicians, residents, fellows, and advanced practice providers (APPs), could be and

were respondents to the survey. Geographic location was ascertained based on respondents' answer to questions about practice location. The survey included 27 questions in the following domains: self-identified gender (woman, man, transgender, prefer not to answer), childcare support, and country and state when applicable), dependents (both children and elderly), race and ethnicity, workflow, work productivity and well-being. Gender was self-reported and was not based on biological sex. Respondents had the option of selecting multiple responses. Race categories were grouped for the analysis as follows: Asian (East Asian and South Asian), Black/African American, Hispanic/Latinx, Middle Eastern/North African, White, and Other (American Indian, mixed race, prefer not to answer). Survey questions and other details are available in eAppendix 1 ([links.lww.com/CPJ/A446](https://links.lww.com/CPJ/A446)). We used Likert scale tables (scores 1–5, 1 = strongly disagree and 5 = strongly agree) to measure participants' work productivity and well-being and to measure the top 3 domains affected during the period of COVID-19-related restrictions.

Outcome measures were domains affected by COVID-19-related restrictions, including (1) work-life balance (time for family vs time for writing and academic work), (2) clinical and academic productivity, and (3) participants' well-being during the period of COVID-19-related restrictions.

We compared findings based on gender, number of dependents, dependent care institutional support (>30 days; <30 days), marital status, and ethnicity/race. We hypothesized that neurologists who identify as women with one or more children had a greater decrease in clinical and academic productivity and increased time to care for children, compared with neurologists who identify as men.

### Statistical Analysis

Categorical response data are presented as n (%) while continuous data are presented as mean, median, SD, and interquartile interval (IQI). Of 243 respondents, 184 (76%) were practicing physicians and clinicians in the United States; we divided responses into US and non-US groups for all subsequent analyses. We used Python and excel (World map software) for statistical analysis. For comparative analysis, we used the Mann-Whitney *U* test and the Kruskal Wallis test for multiple groups. Alpha was set at 0.05.

### Standard Protocol Approvals, Registrations, and Patient Consents

This survey was conducted in Practice Current. The Institutional Board Review (IRB) at Children's National provided a waiver for surveys for Practice Current.

### Data Availability

Anonymized data will be shared on reasonable request from qualified investigators.

## Results

### Respondents' Demographic Characteristics

We received responses from 243 neurology providers (Figure 1: map). Most of the respondents (76%) practiced in the United States. Last responses were received in December 2020; 90% (n = 219) were completed during the first 3 months (eFigure 1, [links.lww.com/CPJ/A447](https://links.lww.com/CPJ/A447)). Of all respondents, 71.6% were women. Most respondents were the primary wage earners (69%), married (86%), and parents (91%). Sixty-four percent respondents worked in hospital settings (inpatient), including 60% of US respondents and 76% of non-US respondents (Figure 2). A large group of respondents worked in academic programs (80%) and were board-certified neurologists (82%) (Figure 3). Approximately half of the respondents were young physicians with less than 10 years of practice since graduation from career training (Figure 2). Seven percent respondents were advanced practice providers, and 11% were physicians in training (residents and fellows) (Figure 2).

A large group of respondents were adult neurologists (76%); 15% were both adult and pediatric care neurologists; and 9% were exclusively pediatric neurologists (Table 1). In the United States, these numbers were 79% adult, 10% pediatric, and 11% adult and pediatric (Table 1). A larger proportion of respondents from other countries provided neurology care for both pediatric and adult populations (27%), with only 6% pediatric and 68% adult. Table 1 summarizes the demographic findings of all respondents and of respondents stratified by practice location.

### Changes in Work-Related Domains During the Most Restrictive Periods of COVID-19

Twenty-eight percent of providers reported working exclusively remotely (34% in the United States, 10% in other

countries). Others had a combination of telemedicine and in-person work, with a majority (43%) who predominantly worked remotely (40% in the United States, 54% in other countries) while 25% were working mainly in person (24% in the United States, 29% in other countries).

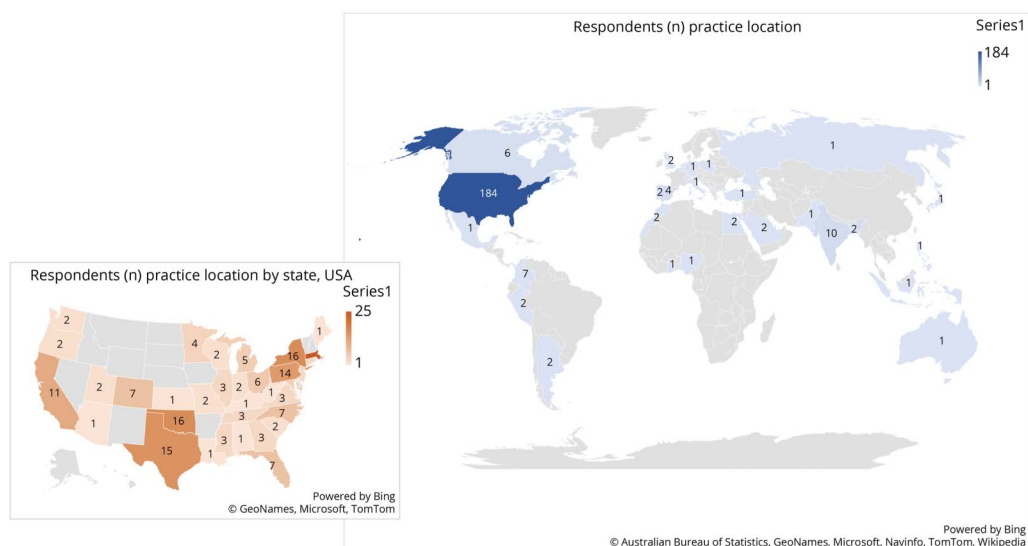
Major effects related to the COVID-19 pandemic were decrease in academic productivity (72%), decrease in salary or work benefits (65%), lack of time for writing (48%), increase in pressure from productivity expectations (47%), lack of time for family (41%), loss of employment safety (35%), increase in work hours (34%), decrease in industry research (23%), and loss of employment (19%) (Figure 4, and eFigure 2, [links.lww.com/CPJ/A448](https://links.lww.com/CPJ/A448)).

### Differences and Similarities by Gender

We present findings based on responses collected from all countries and results when responses are stratified by practice location into 2 groups: the United States and other countries. Table 2 summarizes findings and common and differing results among all responses, responses from the United States, and those from other countries. Survey respondents reported decreased time for writing and academic activities as well as increased administrative work with a significant difference between men and women (men median = 2, IQI [2–4]; women median = 2, IQI [1–3],  $p = 0.01$ , and men median = 4, IQI [3–4]; women median = 4, IQI [3–5],  $p = 0.018$ , respectively). Change in primary specialty was higher in neurology providers who identified as men (men median = 3, IQI [2–4]; women median = 2, IQI [2–3],  $p = 0.002$ ).

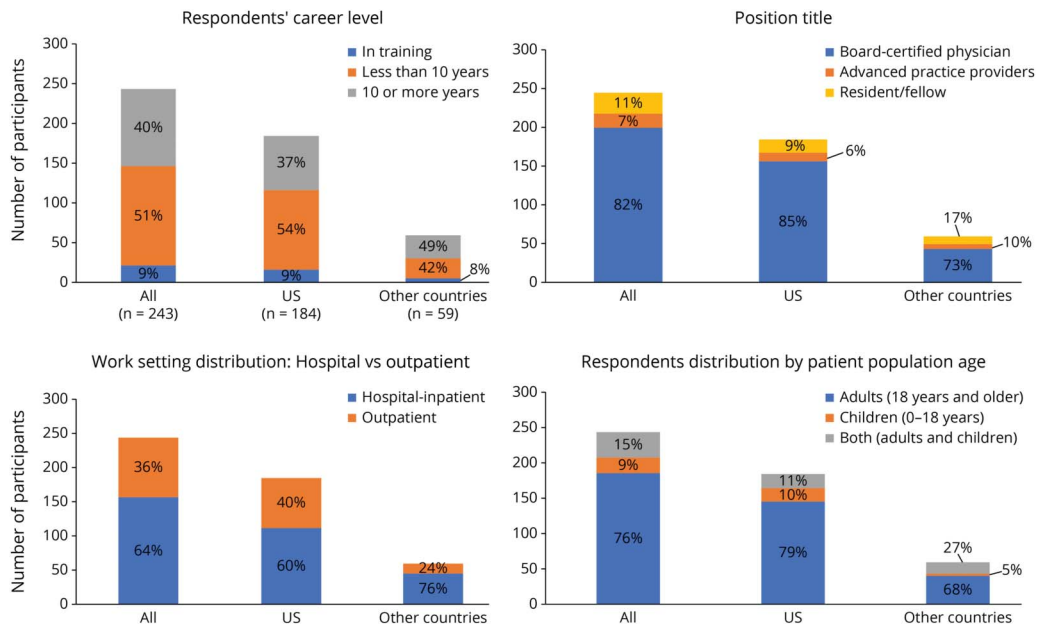
In the United States (n = 184 respondents), compared with providers who identified as men, those who identified as women reported less reduction in quality of patient encounter (men median = 2, IQI [1–2]; women median = 2, IQI [2–3];

**Figure 1** Geographic Distribution of Survey Respondents



Practice locations of survey respondents. Responses were received between June 2020 and December 2020.

**Figure 2** Respondents' Work Characteristics

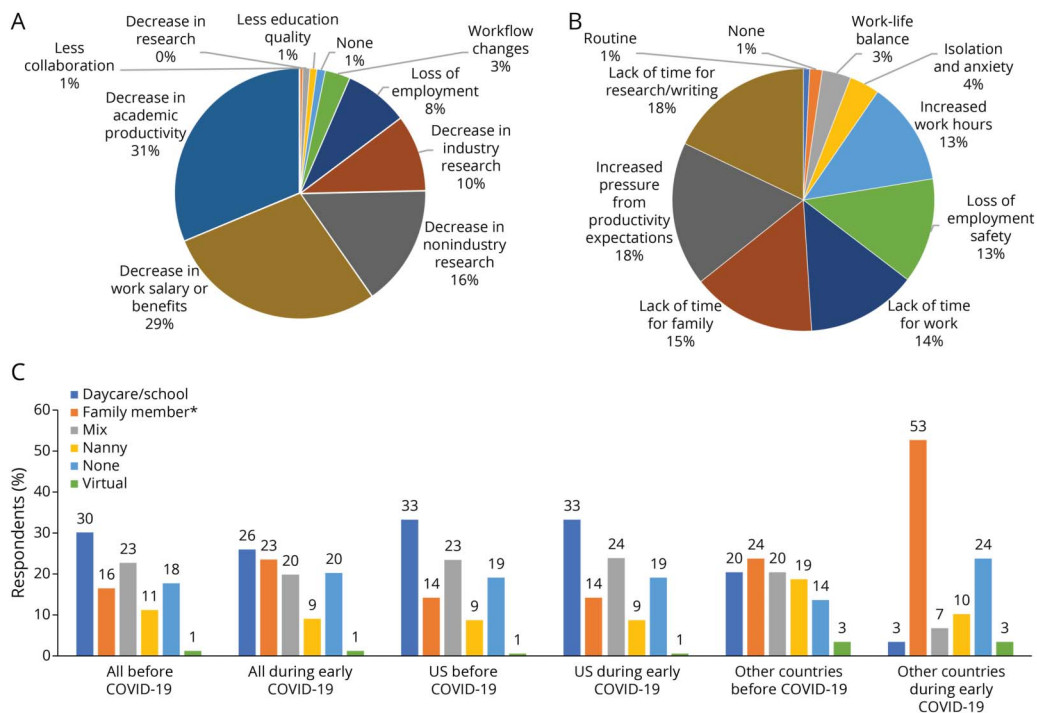


Percentage of survey respondents based on career level (in training [blue], less than 10 years of practice [orange], and in practice for 10 years and more [gray]), work title, work setting (inpatient hospital or outpatient), and patient population (adult or pediatric).

$p = 0.0026$ ), better contribution of telemedicine in reducing burnout (men median = 3, IQI [2–3.75]; women median = 3, IQI [2–4];  $p = 0.043$ ), and relatively lower decrease in quality

and experience of medical education (men median = 2, IQI [1–3]; women median = 2, IQI [2–3];  $p = 0.007$ ). Nevertheless, change in primary specialty was higher in men compared

**Figure 3** Effects of the COVID-19 Restrictive Period on Work (A), Well-being (B), and Childcare Before and During the Early Period After COVID-19 Outbreak (C)



**Table 1** Demographic Information

	All n (%)	US n (%)	Non-US n (%)
<b>Respondents</b>	243	184 (76)	59 (24)
<b>Gender</b>			
<b>Woman</b>	174 (72)	137 (74)	37 (63)
<b>Man</b>	67 (27)	45 (24)	22 (37)
<b>Prefer not to answer</b>	2 (1)	2 (1)	0
<b>Ethnicity</b>			
<b>Asian</b>	57 (23)	38 (21)	18 (31)
<b>Black or African American</b>	6 (2)	5 (3)	1 (2)
<b>Hispanic or Latinx</b>	18 (7)	14 (8)	4 (7)
<b>White</b>	138 (57)	111 (60)	27 (46)
<b>Middle Eastern or North African</b>	7 (3)	2 (1)	5 (8)
<b>Other</b>	17 (7)	14 (8)	4 (6)
<b>Work</b>			
<b>Main earner</b>	168 (69)	130 (71)	38 (64)
<b>Works full time</b>	215 (88)	163 (89)	52 (88)
<b>Patient population</b>			
<b>Adult neurology</b>	185 (76)	145 (79)	40 (68)
<b>Pediatric neurology</b>	22 (9)	19 (10)	3 (5)
<b>Both</b>	36 (15)	20 (11)	16 (27)
<b>Marital status</b>			
<b>Married</b>	209 (86)	165 (90)	44 (75)
<b>Living with a partner</b>	12 (5)	6 (3)	6 (10)
<b>Other</b>	20 (8)	11 (6)	9 (15)
<b>Dependents</b>			
<b>Children</b>	221 (91)	166 (90)	55 (93)
<b>One child</b>	67 (28)	49 (27)	18 (31)
<b>More than one child</b>	154 (63)	117 (64)	37 (63)
<b>No children</b>	22 (9)	18 (10)	4 (7)
<b>Dependent-care support</b>			
<b>Employer support&gt;30 d</b>	26 (11)	23 (13)	3 (5)
<b>Change in childcare support because of COVID-19</b>			
<b>Received subsidized childcare</b>	51 (21)	44 (24)	7 (12)
<b>Parental status influenced job loss</b>			
<b>Parental status influenced job loss</b>	13 (5)	6 (3)	7 (12)

with women (men median = 3, IQI [2–3], women median = 2, IQI [2–3];  $p = 0.009$ ). Responses were similar in outcomes reflecting agreement on decrease in clinical and research productivity, less time for writing and academic activities, and increase in administrative work (Table 2).

In other countries ( $n = 59$  respondents), neurology providers who identified as women reported less contribution of telemedicine in reducing burnout (men median = 4, IQI [2.5–4], women median = 3, IQI [2–3];  $p = 0.024$ ), no increase in time and effort in education (men median = 3.5, IQI [2–4.25], women median = 2, IQI [2–3.5];  $p = 0.05$ ), less time for writing and academic activities (men median = 3, IQI [2–4], women median = 2, IQI [2–2.5];  $p = 0.0131$ ), and more time for administrative work (men median = 3, IQI [2–4], women median = 4, IQI [3–4];  $p = 0.044$ ), compared with neurology providers who identified as men. Findings were similar in responses from both genders for less overall work productivity and clinical productivity (RVU), quality of patient encounter, quality and experience of medical education, decreased research productivity, and change from primary specialty.

### Changes in Personal and Family-Related Domains During the Most Restrictive Periods of COVID-19

Lack of time for family affected 41% of neurology providers (Figure 3). Among other well-being domains, 10 percent reported increased isolation and anxiety. In addition, 9% reported that COVID-19 changes affected balance of work and family time.

Major childcare changes were observed in daycare support, with a significant decrease in daycare support (35% before vs 7% during the COVID-19 restrictive period), significant mix of daycare + family + nanny (21% before vs 14% during the COVID-19 restrictive period), and increased reliance on a family member (18% before vs 33% during the COVID-19 restrictive period) ( $p < 0.001$ ) (Figure 4, and eFigure 3, links. [lww.com/CPJ/A449](https://www.com/CPJ/A449)).

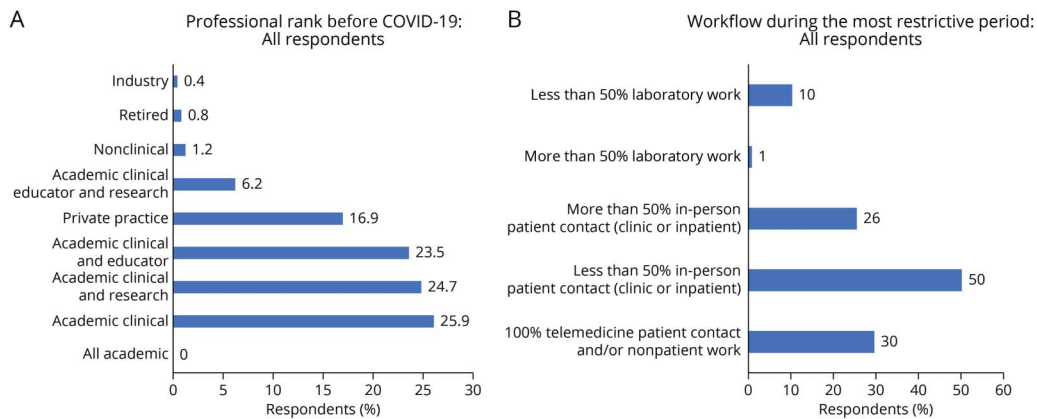
### Differences and Similarities by Gender

Survey respondents reported increased stress and anxiety and an increase in time dedicated to childcare, with a significant difference between providers who identified as men and those who identified as women (men median = 4, IQI [4–5], women median = 5, IQI [4–5],  $p = 0.0001$ , and men median = 4, IQI [3.75–5], women median = 4, IQI [4–5],  $p = 0.006$ ).

In the US group, findings for the abovementioned well-being domains were similar in neurology providers who identified as men and those who identified as women, with increased dependent-care duties; less quality of time with family; and increased stress, anxiety, or depression.

In other countries, providers who identified as women respondents had higher increased stress, anxiety, and depression (men median = 4, IQI [3–4]; women median = 4, IQI [4–5];  $p = 0.006$ ). Responses from both genders (man and woman) reflected a similar increase in dependent care (child and elderly) and increased quality of time with family.

**Figure 4** Professional Rank and Workflow Trends



(A) Survey respondents had an academic appointment in 74.1%. (B) Workflow of survey respondents showed <50% of in-person clinical work.

### Differences and Similarities in Providers With Children

In this comparison, we grouped respondents practicing in the United States and other countries into 2 subgroups: no children (NC) and with children (C). Table 3 summarizes findings for all respondents (all, US, other countries). Differences were observed between the 2 subgroups in the

following categories: clinical productivity (median NC = 2.5, IQI [2–3]; median C = 2, IQI [1–3];  $p = 0.049$ ), education effort (median NC = 3, IQI [2.5–4]; median C = 2, IQI [2–3];  $p = 0.0196$ ), time for dependent care (median NC = 4, IQI [3.75–4]; median C = 5, IQI [4–5];  $p = 0.026$ ), and stress and anxiety (median NC = 4, IQI [3–4]; median C = 4, IQI [4–5];  $p = 0.013$ ) (Table 3).

**Table 2** Effects of COVID-19 Pandemic Outbreak on Neurology Providers by Gender

Category	All countries			US			Other countries		
	Man	Woman	<i>p</i> Value	Man	Woman	<i>p</i> Value	Man	Woman	<i>p</i> Value
	Median [IQI]	Median [IQI]		Median [IQI]	Median		Median [IQI]	Median	
Work productivity increased	2 [1–3]	2 [1–3]	0.261	2 [1–3]	2 [1–3]	0.25	2 [1–3]	2 [1–3]	0.496
Clinical productivity increased	2 [2–3]	2 [1–3]	0.073	2 [1–3]	2 [1–3]	0.130	2 [2–2.25]	2 [1–3]	0.356
Quality of patient encounter has increased	2 [2–3]	2 [2–3]	0.124	2 [1–2]	2 [2–3]	<b>0.0026</b>	3 [2–4]	2 [2–3]	0.0629
Telehealth visits reduced burnout	3 [1–3]	3 [1–3]	0.276	3 [2–3.75]	3 [2–4]	<b>0.043</b>	4 [2.5–4]	3 [2–3]	<b>0.024</b>
Education effort and time increased	2 [1–3]	2 [2–4]	0.054	2 [1–2.75]	2 [2–4]	<b>&lt;0.001</b>	3.5 [2–4.25]	2 [2–3.5]	<b>0.050</b>
Quality and experience of medical education increased	2 [1–3]	2 [2–3]	0.056	2 [1–3]	2 [2–3]	<b>0.007</b>	3 [2–4]	3 [2–4]	0.410
Research productivity increased	2 [1–3]	2 [1–3]	0.392	2 [1–2]	2 [1–3]	0.229	2 [1.75–3]	2 [1–3]	0.335
Writing/academic time increased	2 [2–4]	2 [1–3]	<b>0.018</b>	2 [2–3]	2 [1–3]	0.169	3 [2–4]	2 [2–2.5]	<b>0.0131</b>
Administrative work increased	4 [3–4]	4 [3–5]	<b>0.01</b>	4 [3–5]	4 [3–5]	0.088	3 [2–4]	4 [3–4]	<b>0.044</b>
Clinical service changed from primary specialty	3 [2–4]	2 [2–3]	<b>0.002</b>	3 [2–3]	2 [2–3]	<b>0.009</b>	4 [3–4]	4 [3–4]	0.128
Time for childcare increased	4 [4–5]	5 [4–5]	<b>0.0001</b>	4 [–]	5 [4–5]	<b>&lt;0.0001</b>	4 [4–5]	4 [4–5]	0.496
Quality of time with family increased	3.5 [3–4]	4 [2–4]	0.24	3 [3–4]	3 [2–4]	0.19	4 [2–4]	4 [2–4.25]	0.33
Increased stress and anxiety	4 [3.75–5]	4 [4–5]	<b>0.006</b>	4 [4–5]	5 [4–5]	0.1	4 [3–4]	4 [4–5]	<b>0.006</b>

Abbreviation: IQI = interquartile interval.  
 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree.  
 Bold indicates statistically significant  $p$  values.

**Table 3** Effects of COVID-19 Pandemic Outbreak on Neurology Providers With Children

Category	All countries			United States			Other countries		
	Median [IQI]		<i>p</i> Value	Median		<i>p</i> Value	Median [IQI]		<i>p</i> Value
	NC	C		NC	C		NC	C	
Work productivity increased	2 [2–4]	2 [1–3]	0.150	2.5 [2–4]	2 [1–2.75]	0.133	2 [1.5–3]	2 [1–3]	0.955
Clinical productivity increased	2.5 [2–3]	2 [1–3]	<b>0.049</b>	2 [2–3]	2 [1–3]	<b>0.032</b>	3 [2–3]	2 [2–3]	0.791
Quality of patient encounter has increased	2 [2–3]	2 [2–3]	0.726	2 [2–3.25]	2 [2–3]	0.36	2 [1.5–2.5]	3 [2–3]	0.378
Telehealth visits reduced burnout	3 [3–4]	3 [2–4]	0.666	3 [3–4]	3 [2–4]	0.881	3 [3–3.5]	3 [2–3]	0.488
Education effort and time increased	3 [2.5–4]	2 [2–3]	<b>0.0196</b>	3 [2.75–4]	2 [1–3]	<b>0.025</b>	4 [3–4]	2 [2–4]	0.398
Quality and experience of medical education increased	3 [2–4]	2 [2–3]	0.0516	3 [2–4]	2 [1.5–3]	<b>0.024</b>	2 [2–3.5]	3 [2–4]	0.797
Research productivity increased	2 [2–3.5]	2 [1–3]	0.0798	2 [1.75–3.25]	2 [1–3]	0.20	3 [2.5–3.5]	2 [1–3]	0.146
Writing/academic time increased	3 [1.25–4]	2 [1.75–3]	0.367	3 [1–4]	2 [1–3]	0.596	3.5 [3.25–3.75]	2 [2–4]	0.200
Administrative work increased	3 [3–4]	4 [3–5]	0.169	4 [3–4]	4 [3–5]	0.312	3 [2–3]	4 [3–4]	0.105
Clinical service changed from primary specialty	3 [2–4]	2 [2–4]	0.213	2.5 [2–4]	2 [2–3]	0.116	4 [3.5–4]	4 [3–4]	0.85
Time for dependent care (child or elderly) increased	4 [3.75–4]	5 [4–5]	<b>0.026</b>	4 [4]	5 [4–5]	0.114	4 [3.5–4]	4 [4–5]	0.144
Quality of time with family increased	3 [2–4]	4 [2–4]	0.634	3 [2–3.5]	3 [2–4]	0.321	5 [3.5–5]	4 [3–4]	0.334
Increased stress and anxiety	4 [3–4]	4 [4–5]	<b>0.013</b>	4 [3–4]	5 [4–5]	<b>0.044</b>	3 [3–3.5]	4 [4–5]	0.059

Abbreviations: C = with children; NC = no children.

1: strongly disagree; 5: strongly agree.

Kruskal-Wallis test. Bold indicates statistically significant *p* value (<0.05).

In the United States, survey findings showed differences between respondents with children compared with respondents without children in responses to questions related to clinical productivity (median NC = 2, IQI [2–3]; median C = 2, IQI [1–3]; *p* = 0.032), education effort and time (median NC = 3, IQI [2.75–4]; median C = 2, IQI [1–3]; *p* = 0.025), quality and experience of medical education (median NC = 3, IQI [2–4]; median C = 2, IQI [1.5–3]; *p* = 0.024), and stress and anxiety (median NC = 4, IQI [3–4]; median C = 5, IQI [4–5]; *p* = 0.044).

Survey responses from other countries did not show significant differences between survey respondents with children compared with respondents without children (Table 3).

## Discussion

This study aimed to evaluate the effect of COVID-19 pandemic outbreak on neurology providers globally and to investigate whether gender and parenting contributed to disparate effects in neurology providers. We found that a majority of survey respondents reported a lack of time for writing and academic work and a lack of time for family. Although others speculated that telemedicine might play a role in reducing burnout among physicians,<sup>1,2,9,10</sup> our study findings disagree with this. A majority of respondents reported lack of time for writing and academic

work, reduced time for family, and increased stress and anxiety, even among those who provided care through telemedicine. As an early reflection of these effects and a potential threat to long-term academic promotion, survey respondents reported decreased academic productivity, decreased work salary and/or benefits, and increased pressure from productivity expectations.

A disparate effect on women professionals is particularly concerning in the health care industry, given the extent to which health care relies on women. A global 2017 World Health Organization analysis found that women constituted 67% of health care workers.<sup>11</sup> The number of women physicians increased by 17% between 2000 and 2017,<sup>11</sup> and most of the essential workers during the COVID-19 crisis were women.<sup>12</sup> The pandemic affected female more than male physicians in general.<sup>3–5</sup> In this study, we found that the effect of the pandemic varied based on location of practice. In the United States, both men and women neurology providers reported similarly on reduced time for writing research and academic activities. Women reported significantly reduced time for writing compared with men in other countries. Such location difference might be related to a typical traditional model where women have more unpaid-work time at home.<sup>3,14,15</sup> This difference in findings based on geographic location should be interpreted with caution because of the unexpectedly low number of respondents from other countries (*n* = 59).

In other specialties, the authors reported a greater effect on physicians with children, where women radiologists with at least one child reported lower work productivity<sup>16</sup> and scientist mothers had fewer publications during COVID-19.<sup>4</sup> In this study, we found that neurology providers with children had decreased clinical productivity with increased time for childcare. Unlike previous reports,<sup>4</sup> our results did not show that respondents with children have less time for research and writing, compared with respondents without children. The subanalysis of results from providers practicing in other countries did not show a difference between neurology providers with children compared those without. However, this may be because of the small sample size of this group (other countries n = 59).

School-age and younger children require more attention and guidance from parents. Disruption of school and daycare during COVID-19 outbreak and surges imposed more demands on parents to support virtual learning and homeschooling. The effect was reported by several studies conducted in the United States, Brazil, and Europe that showed decreased work hours for mothers with young children.<sup>8,17,18</sup> Our study showed a very unexpected and surprising finding—neurologist parents with one child were more adversely affected by the pandemic (for clinical, academic and research productivity) than neurologist parents with 2 or more children or neurologists with no children. This particular finding will benefit from closer observation in future studies to determine whether it is an aberration vs a consistent finding. One limitation of this study is the classification of respondents as men or women as opposed to several options to align with the fact that gender exists on a spectrum. Acknowledging the fact that gender exists on a spectrum, the survey questions did ask about respondents' self-identification of gender. While the binary classification of respondents led to simplification of statistical analysis, it potentially could have led to misclassification of some respondents who may identify as nonbinary individuals. A limitation of the survey layout of gender categories (woman, man, transgender, prefer not to answer) can be improved in future studies by adding "transgender woman" and "transgender man."

The sudden outbreak and ongoing surges of COVID-19 dramatically hindered many clinicians' ability to do their jobs; at the same time, those clinicians' productivity requirements often increased, in part, because of crisis-induced financial shortcomings. During the recent "Great Resignation," circa 2021–2022, many professionals have been leaving their work in search of a better work-life balance.<sup>19,20</sup> A recent study in the United Kingdom showed high rates of physicians leaving, changing practice, or contemplating withdrawal from the health care system,<sup>21</sup> many of whom were looking for better quality of life. The well-being of neurologists has been a focus of recent efforts of the AAN and the EAN. The disparate effect of the early COVID-19 crisis was not simply a loss of time available for professional work. The high number of serious COVID-19 cases overwhelmed health care workers and resources in many communities, leading to increased psychosocial distress (insomnia, anxiety, depression, post-

traumatic stress).<sup>22</sup> There was a higher likelihood of psychological manifestations of this distress among workers who were women, young physicians, or workers who were lower in seniority, as well as those who had dependent children, low support, or infected family members.<sup>23,24</sup> In this study, we found high reports of increased pressure from productivity expectations (47%), increased isolation and anxiety (10%), decreased work-life balance (9%), as well as loss of employment safety (35%) and loss of job (19%). This highlights the challenges that we face in managing neurology providers' personal and professional well-being.

Our survey respondents in the United States have similar race distribution to the reported race/ethnicity distribution in neurologist jobs ([zipppia.com/neurologist-jobs/demographics/](https://zipppia.com/neurologist-jobs/demographics/)) and neurology residency programs ([aamc.org/data-reports/students-residents/data/report-residents/2020/table-b5-md-residents-race-ethnicity-and-specialty](https://aamc.org/data-reports/students-residents/data/report-residents/2020/table-b5-md-residents-race-ethnicity-and-specialty)), with a majority of White (60%, 61%, 42%) and lower representation of Asian (21%, 18%, and 21%), Black/African American (3%, 4.9%, and 4.4%), and Hispanic (8%, 9.6%, and 7.2%), respectively, in our survey, neurologist jobs, and neurology residents. Our study has several limitations that we would like to acknowledge and further investigate in future studies. Our survey was posted on the AAN website, which may cause recruitment bias reflected in a majority (76%) from the United States. We do not know how many of these respondents were AAN members. Results should be interpreted with caution and would not necessarily reflect specific countries because of low response numbers from each of other countries other than the United States. Therefore, findings would not be generalizable for all or each individual country. Within the United States, differences in response numbers between states do not reflect state-level response conditions, nor would it allow making conclusions for each state or comparison between states. Moreover, the results presented could represent some responder bias such that providers who responded to the survey may represent those who were affected deleteriously by COVID-19 while those who experienced less changes were less likely to respond to the survey. Moreover, although gender was self-reported (not biological sex) and participants had the option of selecting more than one option, none of the respondents self-identified as transgender. Therefore, the survey did not allow to disaggregate persons who identify as transgender women among women respondents and persons who identify as transgender men among men respondents. We acknowledge that gender is a term used by the medical community and may be an unclear terminology causing confusion for some of the respondents, imposing a limitation for our study.

The seemingly interminable cycle of COVID-19 surges, despite global vaccination efforts, raises the specter of renewed disruption of education and childcare that could be caused by another crisis of any sort that could affect one or multiple countries. It is imperative to glean whatever lessons we can from our early-crisis experience, to prepare ourselves for similar challenges going forward. Bridging the gap between clinicians' and employers' needs and expectations during such crises could help prevent the departure of academic and clinical neurologists. To promote a robust health care system, leaders and organizations should



consider neurologists' and other health care providers' well-being in the same way they consider their productivity. Actionable items for doing so have been proposed in academia and elsewhere.<sup>7,13,25</sup> As a neurology community, we need to develop and implement such actionable items to mitigate the short and long-term loss of our diverse members.

Our findings suggest that some or many neurology providers experienced reduced clinical and/or academic productivity during the COVID-19 pandemic. Future studies including evaluating the differential effect in academic tenure promotion, effects on income, and child-rearing in larger studies (using probability sampling) would ultimately help medical societies and institutions recognize 'hidden' COVID-19 crisis effects on their faculty members' career advancement and help mitigate the long-term effects of the crisis on the gender gap and on parental well-being.

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### Appendix Authors

Name	Location	Contribution
<b>Myriam Abdennadher, MD</b>	Department of Neurology, Boston University School of Medicine; Boston Medical Center, MA	Drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design; analysis or interpretation of data

### Appendix (continued)

Name	Location	Contribution
<b>Sima Patel, MD</b>	Department of Neurology, University of Minnesota Medical School, Minneapolis	Drafting/revision of the manuscript for content, including medical writing for content; study concept or design
<b>Kate Dembny, BS, BA</b>	Department of Neurology, University of Minnesota Medical School, Minneapolis	Drafting/revision of the manuscript for content, including medical writing for content; analysis or interpretation of data
<b>Roya Edalatpour, MD</b>	Department of Neurology, Boston University School of Medicine, MA; Department of Neurology, University of Texas at Austin Dell Medical School	Analysis or interpretation of data
<b>Janice Weinberg, ScD</b>	Boston University School of Public Health, MA	Drafting/revision of the manuscript for content, including medical writing for content; analysis or interpretation of data
<b>Luca Bartolini, MD</b>	Division of Pediatric Neurology, Hasbro Children's Hospital; The Warren Alpert Medical School of Brown University, Providence, RI	Drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design
<b>Aravind Ganesh, MD, DPhil</b>	Departments of Clinical Neurosciences and Community Health Sciences, and the Hotchkiss Brain Institute, University of Calgary Cumming School of Medicine, Alberta, Canada	Drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design; analysis or interpretation of data; additional contributions: co-senior author
<b>Divya Singhal, MD</b>	Department of Neurology, University of Texas at San Antonio, TX	Drafting/revision of the manuscript for content, including medical writing for content; study concept or design

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