

Pandemic Preparedness and the Workforce: Employer Experiences with Long COVID

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ABSTRACT

BACKGROUND: Although viral infections, including SARS-CoV-2, can cause persistent symptoms and functional limitations, the impact of post-viral syndromes on workplaces is uncertain.

METHODS: We conducted a cross-sectional study of workplaces in Rhode Island in the D&B Hoovers database (September–October 2022). Eligible workplaces had ≥ 1 contact with a valid email address and ≥ 2 paid employees. Participants completed a survey on the impact of Long COVID (post-viral syndrome of SARS-CoV-2) on their workplace.

RESULTS: Of 6,149 eligible workplaces, 484 (8%) participated. Awareness of Long COVID among workplace leaders was limited. Overall, 28% of workplaces had any employees report having Long COVID. Of those, 14% had ≥ 1 employee discontinue employment, 45% had ≥ 1 employee reduce their workload, and 22% had ≥ 1 employee request an accommodation due to having Long COVID; 80% of employers reported improvement in employee productivity with accommodations.

CONCLUSION: Pandemic preparations for the long-term impacts of post-viral syndromes should consider workplace settings.

KEYWORDS: Pandemic preparedness; occupational health; post-viral syndrome; COVID-19; Long COVID

INTRODUCTION

Many viral infections can lead to post-viral syndromes in some patients, including polio, dengue, Epstein-Barr, influenza, and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) among others. Though the symptoms of acute infection with each of these viruses can be distinctive, many of the long-term symptoms of their post-viral syndromes are similar, such as fatigue, exercise intolerance, flu-like symptoms, and neurological complications.^{1,2} Post-viral syndromes can greatly impact people's quality of life and ability to work,¹ making anticipation of these long-term effects of infection an important component of pandemic preparedness.

During the Coronavirus Disease 2019 (COVID-19) pandemic, widespread recognition of the long-term impacts of acute SARS-CoV-2 infection was slow to emerge.³ The post-viral syndrome known as Long COVID most commonly includes symptoms of fatigue, shortness of breath, chest pain, and cough.⁴⁻⁷ As of February 2023, as many as one in 20 people in the United States (US) were estimated to have lingering effects of COVID-19,⁸ with some experiencing severe impacts on their quality of life and function.⁸⁻¹⁶ Consequently, there has been significant concern for not only the individual impacts of Long COVID, but the impacts on the workforce and economy. In 2022, as many as two to four million working-age adults in the US were estimated to be out of the workforce due to Long COVID.¹⁷ Lost earnings, diminished quality of life, and increased medical spending associated with Long COVID may contribute to vast economic impacts. In one study, the cost of Long COVID in the US through 2021 was estimated at \$3.7 trillion.^{18,19}

While such studies provide a macroeconomic view on the impacts of Long COVID, less is known about the effects on workplaces and their employees. Emerging evidence has suggested that many people with Long COVID may not be able to return to work or may experience decreased productivity at work, even with accommodations such as telework and flexible hours.²⁰⁻²² However, the studies were conducted early in the pandemic and in Europe, highlighting the need for more recent data and information from other geographic settings with distinct health and social systems. Additionally, these previous studies focused on the impacts of Long COVID for individual employees; the impact on workplaces, including productivity and accommodations provided for employees, remains uncertain. To help fill these important gaps and prepare the workforce for future viral pandemics, we conducted a study of the impact of Long COVID on workplaces in the state of Rhode Island.

METHODS

We conducted a cross-sectional study of workplaces in Rhode Island. The study was not considered human subjects research because survey respondents were "key informants" on their workplace; therefore, the study did not meet criteria for review by the Brown University Institutional Review Board.²³

Sample selection

The D&B Hoovers Web-based platform (Austin, Texas)²⁴ was used to identify a sample of 7,263 workplaces in Rhode Island. D&B Hoovers maintains a paid-access platform that provides searchable information (including employee contact information) on more than 330 million workplaces worldwide, which are identified using data from trade, registry, and other sources; millions of websites; and D&B Hoovers' vendors, partners, customers, and third parties.²⁵ For each workplace sampled, one professional was selected for invitation to participate in the study, with preferential selection of human resources professionals due our interest in the impact of Long COVID on employees at the workplace. The list of invitees was generated from August 8 to August 30, 2022.

To select the sample using the D&B Hoovers platform, the database was filtered to view and extract *all* employee contacts in Rhode Island who had an email address listed. Subsequently, SAS version 9.4 (Cary, North Carolina) was utilized to select the most suitable contact per workplace using a pre-specified hierarchy based on job function, job title, and seniority level. Briefly, the most senior human resources professional was considered to be the most suitable contact. If no human resources professionals were listed, then the most senior benefits and compensation executive was selected. If no benefits and compensation executives were listed, then the most senior employee was selected. One individual from each workplace was then randomly selected among all employees identified as being the most suitable contact. This process yielded a list of contact information for 7,263 unique professionals at 7,263 unique workplaces in Rhode Island.

Contacts with invalid email addresses were classified as ineligible. Additionally, a screening question at the beginning of the survey was used to determine whether the workplace had at least two employees paid by the organization. Respondents who reported fewer than two paid employees were classified as ineligible, as their responses would provide limited insight on workplace productivity and accommodations.

To check data quality of the contact list, a subset of 512 contacts was selected for verification through open-source intelligence (i.e., finding the contact and workplace on publicly available Web pages through a Google search). Of the 512 contacts, only 13% could not be validated, providing confidence in the quality of the contact list.

Survey data collection

The 7,263 professionals were invited to complete the Web-based Qualtrics study survey on September 28, 2022. Invitations were sent via email, and three reminder emails were sent to those who had not yet completed the survey. Invitees were provided with the option of sharing the email address of an alternative employee at the workplace who may be

better able to complete the survey. Another unique email invitation was subsequently sent to any newly identified individuals. The survey closed on October 28, 2022. Respondents were offered a \$20 electronic Amazon gift card as compensation for their time participating in the study.

The study survey, which is available in the **Supplementary Appendix** by emailing corresponding author, collected information regarding COVID-19 workplace policies and overall pandemic impact, the specific impact of Long COVID, and accommodations requested and granted for Long COVID. The World Health Organization's October 2021 definition of Long COVID⁴ was included to provide standard terminology for those who may not be familiar with the condition. Productivity impacts were measured by the number of employees who had to reduce workloads or discontinue employment due to Long COVID. The survey questions on Long COVID accommodations were based on guidance regarding the Americans with Disabilities Act (ADA) of 1990 from the US Equal Employment Opportunity Commission²⁶ as of October 28, 2021.

Data management and analysis

Study data were managed and analyzed in SAS. The characteristics of workplaces were summarized by study participation status. Survey responses were summarized among workplaces that participated in the study. For each survey question summarized, participants who had discontinued the survey before reaching that question were excluded from the denominator. Additionally, counts of less than 10 along with associated percentages were suppressed to protect participants' confidentiality.

RESULTS

Survey response

Of 7,263 professionals at unique workplaces in Rhode Island who were invited to participate in the study, 893 (12%) were ineligible due to invalid email addresses, 136 (2%) were ineligible due to no longer being in the position, and 85 (1%) were ineligible due to having fewer than two employees paid by the organization. Of the remaining 6,149 professionals, 484 (8%) participated by responding to at least one survey question. Of 484 participants, 406 (84%) fully completed the survey, while 78 (16%) partially completed the survey.

Characteristics of invited workplaces

Of 7,263 invited workplaces, most (92%, n=6,669) were small organizations with fewer than 50 employees (**Table 1**). About half of workplaces (52%, n=3,776) were part of an industry where remote work is often feasible. Most were private (86%, n=6,232) and independent (80%, n=5,834) workplaces. Just over half of workplaces (55%, n=3,965) were located in Providence County, which is the county containing the state's capital city. The characteristics of workplaces that did and did not participate in the study were generally similar.

However, compared to workplaces that did not participate, those that participated were somewhat less likely to be part of an industry where remote work is often feasible (45% vs. 53%), somewhat more likely to be a non-profit organization (18% vs. 9%), and somewhat less likely to be a private company (76% vs. 88%). The characteristics of participating workplaces stratified by whether they partially or fully

Table 1. Characteristics of invited workplaces, overall and by survey participation status

	Invited N=7,263		Did not participate* N=6,779		Participated N=484		p-value
	n	(%)	n	(%)	n	(%)	
Size							0.24
Small (0–49 employees)	6,669	(92)	6,225	(92)	444	(92)	
Medium (50–249 employees)	512	(7)	474	(7)	38	(8)	
Large (250 or more employees)	82	(1)	80	(1)	<10		
Industry where remote work is often feasible†							0.01
Yes	3,776	(52)	3,559	(53)	217	(45)	
No	2,818	(39)	2,611	(39)	207	(43)	
Unknown	669	(9)	609	(9)	60	(12)	
Ownership type							<0.01
Nonprofit	708	(10)	619	(9)	89	(18)	
Partnership	177	(2)	163	(2)	14	(3)	
Private	6,232	(86)	5,865	(88)	367	(76)	
Public	14	(<1)	14	(<1)	0	(0)	
Public sector	132	(2)	118	(2)	14	(3)	
Entity type							0.04
Branch	674	(9)	646	(10)	28	(6)	
Independent	5,834	(80)	5,426	(81)	408	(84)	
Parent	534	(7)	499	(7)	35	(7)	
Subsidiary	221	(3)	208	(3)	13	(3)	
County							0.74
Bristol	341	(5)	317	(5)	24	(5)	
Kent	1,228	(17)	1,152	(17)	76	(16)	
Newport	823	(11)	775	(12)	48	(10)	
Providence	3,965	(55)	3,692	(55)	273	(56)	
Washington	890	(12)	827	(12)	63	(13)	

* Includes N=1,114 workplaces that were ineligible due to the contact having an invalid email address (n=893), the contact no longer working in that position (n=136), or the workplace having fewer than two employees paid by the organization (n=85).

† Classified the National American Industry Classification System code for each workplace into these categories based on the Spring 2022 McKinsey American Opportunity Survey on remote-work availability by occupation and role, as well as the 2017 North American Industry Classification System descriptions of industries.

completed the survey are available in **Supplemental Table S1**, and their detailed industry classifications are available in **Supplemental Table S2**, by emailing corresponding author.

Table 2. COVID-19 workplace policies and pandemic impact

	n	(%)
Most strict masking policy (N=448)		
Required to wear a mask at all times	220	(49)
Required to wear a mask when working close to other people	127	(28)
Recommended to wear a mask at all times	21	(5)
Recommended to wear a mask when working close to other people	55	(12)
Not required or recommended to wear a mask	23	(5)
No response	<10	
Most strict testing policy for on-site staff (N=454)*		
Required for all staff	94	(21)
Required only for unvaccinated staff	24	(5)
Not required of any staff	311	(69)
No on-site staff	25	(6)
Current vaccination policy (N=468)		
Required for all staff	93	(20)
Required for all staff but with medical/religious exceptions	38	(8)
Required for certain staff (e.g., customer-facing)	<10	
Choice of vaccination or regular testing	12	(3)
Recommended but not required	223	(48)
No requirement or recommendation	87	(19)
Other	<10	
Current vaccination coverage - primary vaccination series (N=460)		
0-25%	12	(3)
26-50%	11	(2)
51-75%	44	(10)
75-100%	277	(60)
Don't collect vaccination information	68	(15)
Don't know	48	(10)
Ever reduced operations during pandemic (N=448)		
Yes	306	(68)
No	141	(31)
No response	<10	
Workplace productivity is back at pre-pandemic levels (N=446)		
Strongly agree	204	(46)
Agree	171	(38)
Disagree	59	(13)
Strongly disagree	11	(2)
No response	<10	

* Survey question asked about regular COVID-19 testing policies at any time during the pandemic.

COVID-19 workplace policies and pandemic impact

Among participating workplaces, nearly half (49%, n=220/448) had required employees to wear a mask at all times at some point during the pandemic (Table 2). Only 5% of workplaces (n=23/448) reported no mask requirement or recommendation at any point. More than two thirds of workplaces (69%, n=311/454) had not required testing for any employees at any point. At the time of the survey, nearly half of workplaces (48%, n=223/468) recommended but did not require vaccination among their employees; only 20% (n=93/468) required vaccination for all employees, while another 8% (n=38/468) required vaccination but with some medical or religious exemptions. The majority of workplaces (60%, n=277/460) reported that 75 to 100% of employees had completed the primary vaccination series. Most workplaces (68%, n=306/448) had reduced operations at some point during the pandemic, with 46% (n=204/446) strongly agreeing that productivity had returned to pre-pandemic levels. At nearly half of workplaces (46%, n=204/440), leaders had never discussed Long COVID as a condition that may affect employees. The largest number of workplaces (38%, n=164/437) had “very low” concern among leadership

Table 3. Awareness of Long COVID among workplace leaders

	n	(%)
Frequency with which workplace leaders have discussed Long COVID as a condition that may affect employees (N=440)		
Never	204	(46)
1–2 times	121	(28)
3–5 times	28	(6)
>5 times	35	(8)
Don't know	50	(11)
No response	<10	
Level of concern among workplace leaders about the impact that Long COVID may have on work productivity (N=437)		
Very high	15	(3)
Above average	27	(6)
Average	117	(27)
Below average	40	(9)
Very low	164	(38)
Don't know	74	(17)
Workplace leaders are aware of the ADA guidelines for Long COVID (N=422)		
Strongly agree	56	(13)
Agree	172	(41)
Disagree	150	(36)
Strongly disagree	42	(10)
No response	<10	

* Survey question asked about regular COVID-19 testing policies at any time during the pandemic.

about the impact that Long COVID may have on productivity. Additionally, nearly half of workplaces (46%, n=192/422) disagreed or strongly disagreed that leadership was aware of ADA guidelines for Long COVID.

Impacts of Long COVID on the workplace and productivity

Overall, 56% of workplaces (n=224/436) indicated that none of their employees had reported having Long COVID, while 28% (n=122/436) had at least one employee report having the condition (Table 3). Most of the workplaces with any employees reporting having Long COVID indicated that one to five employees had the condition (92%, n=112/122). Among workplaces that may have had at least one employee with Long COVID (i.e., those that reported having an employee with Long COVID or did not respond to that question), 14% (n=17/120) had at least one employee discontinue employment because of Long COVID, and 45% (n=54/121) reported that at least one employee had to reduce their workload due to the condition.

Table 4. Impacts of Long COVID on the workplace and productivity

	n	(%)
At least one employee reported having Long COVID (N=436)		
No	244	(56)
Yes	122	(28)
Don't know	70	(16)
At least one employee discontinued employment due to having Long COVID (N=120)*		
No	96	(80)
Yes	17	(14)
Don't know	<10	
No response	<10	
At least one employee reduced their workload due to having Long COVID (N=121)*		
No	60	(50)
Yes	54	(45)
Don't know	<10	
No response	<10	
At least one employee requested accommodations for Long COVID (N=118)*		
No	85	(72)
Yes	26	(22)
Don't know	<10	
At least one employee reduced their workload due to caring for a family member or friend with Long COVID (N=433)		
No	327	(76)
Yes	37	(9)
Don't know	69	(16)

* Among workplaces where at least one employee reported having Long COVID and workplaces that did not respond to that question.

Accommodations for Long COVID

Among workplaces that may have had at least one employee with Long COVID, 22% (n=26/118) reported that at least one employee had requested job accommodations for Long COVID (Table 4). At workplaces where accommodations had been requested, the two most requested and granted accommodations were adjustments to work schedules (85%, n=22/26 requested and granted) and permission for remote work (58%, n=15/26 requested and granted). Most workplaces that had granted accommodations for Long COVID (80%, n=20/25) reported that the accommodations had an effect on returning the employee to their pre-Long COVID productivity level. Of those reporting any effect on productivity, most (85%, n=17/20) reported a minor or moderate effect. Among all workplaces, 47% (n=196/418) reported that they would modify work schedules, and 35% (n=148/418) reported that they would grant permission for remote work, if requested by an employee with Long COVID.

DISCUSSION

Among a sample of workplaces from across Rhode Island, respondents at nearly half of workplaces reported that workplace leaders had below average concerns for Long COVID (47%), had never discussed Long COVID as a condition that may impact employees (46%), and were not aware of ADA guidelines for Long COVID (46%). In contrast, workplace adaptations for acute COVID-19 were more common (e.g., 77% had ever required employees to mask at all times or when working close to other people). Most workplaces indicated that no employees had reported having Long COVID (56%) or that they did not know if any employees had reported having Long COVID (16%); only 28% had any employees report that they had the condition. Among workplaces that may have had an employee with Long COVID, 14% had at least one employee discontinue employment, 45% had at least one employee reduce their workload, and 22% had at least one employee request an accommodation for the condition. Most accommodations requested for Long COVID were granted, with the most common requests being work schedule adjustments and remote work options.

Table 5. Workplace accommodations for employees with Long COVID

	n	(%)
Accommodations requested by an employee (N=26)[†]		
Modifying equipment and/or devices	<10	
Restructuring roles	<10	
Modifying work schedules	22	(85)
Reassigning to a vacant position	<10	
Adjusting or modifying examinations, training materials, or policies	0	(0)
Providing readers and interpreters	0	(0)
Making the workplace more readily accessible and usable	<10	
Granting remote-work options (if in-person work is typically required)	15	(58)
Other	<10	
None	<10	
Accommodations granted to an employee (N=26)[†]		
Modifying equipment and/or devices	<10	
Restructuring roles	<10	
Modifying work schedules	22	(85)
Reassigning to a vacant position	<10	
Adjusting or modifying examinations, training materials, or policies	0	(0)
Providing readers and interpreters	0	(0)
Making the workplace more readily accessible and usable	<10	
Granting remote-work options (if in-person work is typically required)	15	(58)
Other	0	(0)
None	<10	
Accommodations likely granted if requested by an employee (N=418)		
Modifying equipment and/or devices	59	(14)
Restructuring roles	116	(28)
Modifying work schedules	196	(47)
Reassigning to a vacant position	58	(14)
Adjusting or modifying examinations, training materials, or policies	37	(9)
Providing readers and interpreters	15	(4)
Making the workplace more readily accessible and usable	70	(17)
Granting remote-work options (if in-person work is typically required)	148	(35)
Other	27	(6)
None	122	(29)
No response	<10	
Effect of accommodations on employee productivity (N=25)		
No effect	<10	
Any effect	20	(80)
There have not been any modifications	<10	
No response	<10	

[†] Among workplaces where at least one employee had requested an accommodation for Long COVID and workplaces that did not respond to that question.

Most workplaces (80%) reported some improvement in productivity with accommodations.

The finding that only 28% of employers reported having an employee with Long COVID suggests a mismatch with the suspected population burden of Long COVID. Given that roughly 15% of the adult population reports ever having had Long COVID,⁸ this may suggest that many people with Long COVID do not consider their symptoms to be of sufficient severity and/or to have a sufficient impact on their work responsibilities to warrant reporting to their employer. A prior study found that 22% of workers with Long COVID did not ask for accommodations because they felt that their symptoms were not severe enough.²⁷ However, it is also possible that some people with Long COVID who would benefit from workplace accommodations do not feel comfortable reporting the condition to their employer. For example, that same study found that 42% either lacked information about or did not feel safe requesting accommodations.²⁷ Proactive and transparent discussions with employees about health, possible accommodations, request processes, and workplace expectations would be useful.²⁰

While employers frequently reported workplace adaptations for acute COVID-19 (e.g., masks), there was less awareness and concern about Long COVID, consistent with previous findings.²⁷ In a roundtable discussion with US business leaders and employers in January 2022, many reported that they remained focused on the immediate issues of acute COVID-19 (e.g., testing and vaccination) and employee mental health, with limited time and resources to also focus on the impact of Long COVID.²⁸ Employers also expressed that the lack of clarity on clinical aspects of the condition, its impact on function, and possible accommodations limited their ability to anticipate employee needs within ADA requirements and other federal guidance.²⁹⁻³¹ The lack of clarity on Long COVID may also reflect greater availability of resources regarding how employers can support employees with COVID-19^{32,33} versus Long COVID,³⁴ although the extent to which workplaces would actively seek out these types of resources is unclear. Nonetheless, clear and accessible resources on Long COVID with actionable steps that employers can take now to support their employees may be useful for improving awareness and concern about the condition among employers, particularly if disseminated through existing infrastructure routinely accessed by employers. Additional research with employers would be valuable to identify demand for this type of information, as well as preferred strategies and infrastructure for dissemination.

Despite limited concern about Long COVID among workplace leaders, almost all workplaces in the present study reported granting the types of accommodations that had been requested. Additionally, workplaces that did not have any known employees with Long COVID also anticipated providing a variety of accommodations, if requested in the future. These findings are consistent with a national survey

that found that 99% of people with Long COVID received some or all of their requested accommodations, and that 84% were at least neutral or satisfied with their employer's response.²⁷ In the present study, employers reported that Long COVID accommodations were often helpful, as a majority of workplaces that granted accommodations found them to provide at least some improvement in employee productivity, mirroring prior evidence that disability accommodations increase productivity and allow employers to retain valued employees.³⁵ Given the benefits of workplace accommodations and receptivity of employers to grant accommodations, it is especially important for employers to foster a workplace environment that encourages employees to seek supports for health conditions.

This study was subject to important limitations. First, the survey does not provide insight on the underlying prevalence of Long COVID among employees because respondents (employers) were only able to report on cases of Long COVID that had been reported to them (i.e., likely only the most severe cases). However, this study complements prior work by its focus on the impacts of Long COVID on workplaces as a whole, as opposed to individual employee or patient experiences with Long COVID. Second, although the study included a statewide sample of workplaces in Rhode Island identified through the D&B Hoover platform, the extent to which the platform's data are up-to-date and representative of all workplaces in Rhode Island is uncertain. In a data quality review of a subset of 7% of contacts, most (87%) were identified as valid, providing some confidence in the data quality. Third, the response rate was low (8%) despite repeated contact attempts, though it was encouraging that participating workplaces were generally similar to those that did not participate. Nonetheless, most of the participating workplaces were small, private, and independent organizations, and the sample was too small to stratify analyses by workplace size and type. While the overall sample generally aligns with the types of workplaces most common in Rhode Island,^{36,37} the findings are less generalizable to other types of workplaces and workplaces in other regions of the US. Finally, there are multiple definitions of Long COVID, and the symptoms associated with Long COVID are also associated with other conditions and factors.³⁸ We provided survey respondents with the World Health Organization consensus definition⁴ to provide standard terminology for those unfamiliar with the definition; however, there are important limitations to this definition.³⁹ Additionally, the clinical characteristics of employees reporting having Long COVID to their employers are unknown (e.g., whether they had a diagnosis and, if so, by what criteria).

In conclusion, just under one third of surveyed workplaces reported having an employee with Long COVID, though this is likely an underestimate due to some employees not sharing the condition with their employer despite functional limitations and limited awareness of the condition

among employers. Very few employees with Long COVID discontinued employment. Others reduced their workload or requested workplace accommodations, which were generally beneficial for improving their productivity. These findings highlight the importance of anticipating the long-term effects of infection on the workforce as a key component of pandemic preparedness planning. Resources with actionable steps that employers can take now to support their employees with post-viral syndromes may be useful for improving awareness of the conditions, facilitating more rapid support for impacted employees in future pandemics, and minimizing the economic impacts of viral pandemics.

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