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Health-related adverse work outcomes associated with post COVID-19 condition: a cross-sectional study

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ABSTRACT

Introduction Symptoms from post COVID-19 condition (PCC) can impair functioning in working-age adults. However, there is uncertainty about the relationship between PCC and work outcomes. This study aimed to assess health-related adverse work outcomes in individuals with a PCC history compared with others who had COVID-19.

Methods This was a cross-sectional study in which participants in British Columbia (BC) completed an online questionnaire. Participants comprised adults who tested positive for SARS-CoV-2 by PCR at least 2 years before questionnaire completion and were working age (18–64) at the time of infection. PCC status was determined by self-report. The health-related adverse work outcomes evaluated included change in occupation or employer, reduced workload, increased sick days compared with before COVID-19, early retirement and indefinite sick leave. Analyses were weighted to reflect the characteristics of individuals who had COVID-19 in BC. Propensity score overlap weighting was used to adjust for relevant sociodemographic and clinical covariates.

Results Among 1106 participants, 966 (87.3%) were employed when they contracted SARS-CoV-2 and included in analyses. Of these participants, 47.8% were female, the median age was 37 and 46.9% had a PCC history. Compared with other individuals who had COVID-19, those with a PCC history were more likely to have had a health-related adverse work outcome (46.5% vs 24.9%; adjusted OR (aOR) 2.6 (95% CI 1.7 to 4.0)) and reported a greater number of sick days in the first 2 years since contracting SARS-CoV-2 (adjusted mean difference 43 days (95% CI 20 to 65)). The risk of a health-related adverse work outcome was especially high in those with post-COVID-19 fatigue (aOR 4.6 (95% CI 2.7 to 7.9)), fever (aOR 4.0 (95% CI 1.7 to 9.6)), weakness (aOR 3.8 (95% CI 2.2 to 6.3)), palpitations (aOR 3.3 (95% CI 2.0 to 5.0)) and brain fog (aOR 3.2 (95% CI 2.0 to 5.0)).

Conclusions PCC is associated with health-related adverse work outcomes. This is an important consideration for clinicians, employers and health system leaders.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Post-COVID-19 condition (PCC, also known as long COVID) has affected up to 400 million people worldwide and can significantly impair functioning in working-age adults; the impact of PCC on the workforce is an emerging public health issue worldwide.

⇒ Some studies have directly examined associations between PCC and work outcomes, but most of these studies were based in Europe, focused only on the initial periods following acute illness and did not examine potentially important work outcomes such as change in occupation and absenteeism (sick days). It is also unclear which PCC symptoms may affect work.

WHAT THIS STUDY ADDS

⇒ Our study provides further evidence that PCC can impact the ability to work. Specifically, we identified that absenteeism may be a major issue for employed adults who develop PCC.

⇒ We also identified specific PCC symptoms strongly associated with experiencing a health-related adverse work outcome: fatigue, fever, weakness, palpitations and brain fog. Cough, chest pain and loss of taste or smell were not associated with experiencing a health-related adverse work outcome.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results of our study suggest that clinicians and healthcare systems should prioritise work-related issues when supporting people with PCC. For example, they should screen for these issues during routine care and include occupational therapists and social workers in multidisciplinary PCC clinics.

⇒ Employers and disability insurance policy-makers should expect greater absenteeism from the PCC population and be prepared to provide workplace accommodations, such as reduced work hours and the option to work from home.

INTRODUCTION

In the wake of the COVID-19 pandemic, there remains substantial concern regarding the long-term sequelae of COVID-19.[1] The WHO and the National Academies of Sciences, Engineering and Medicine (NASEM) have defined post-COVID-19 condition (PCC or long COVID) as new or persistent symptoms

occurring at least 3 months after SARS-CoV-2 infection.[2 3] It is estimated that 400 million people worldwide had been affected by PCC by the end of 2023.[4] PCC can result in potentially disabling symptoms such as fatigue and cognitive difficulties.[5–7] Although individuals of all ages are at risk of PCC, it is believed that working-age adults (aged 18–64) have been disproportionately susceptible.[8–10] The significant number of previously high-functioning working-age adults affected by PCC has led to speculation that it has contributed to widespread labour shortages.[11–14] Multiple reports from academia and the mainstream media have purported that pervasive disability from PCC has tangibly impacted the economy,[11 12 14–17] with some characterising this phenomenon as a 'mass disabling event'.[18–21]

Some studies have directly evaluated whether post-COVID-19 sequelae can impact work outcomes, but further research is required for several reasons. First, only a few studies specifically compare the labour market experiences of people with PCC to other individuals who had COVID-19.[22–25] Second, nearly all of these studies have been based in Europe.[26–33] More data are required from other parts of the world, as workplace policies and the availability of government benefits can differ by jurisdiction, and the presentation of PCC may vary by ethnic background.[34] Third, data from more representative populations are required, as most prior studies are from web-based surveys or single centres.[7 35–42] Fourth, most studies thus far have focused on sick leave or unemployment in the months after acute COVID-19 illness,[7 24 28 32 36 41 43] and it is unclear how PCC impacts individuals once they have returned to work. People with PCC have reported challenges in obtaining long-term disability benefits,[44–46] and some may have returned to work prematurely.[31] Fifth, people with PCC can present with multiple symptoms,[5 7] but it is unclear which symptoms impact work outcomes most and, therefore, require greater attention.

A complete assessment of the health-related adverse work outcomes in people with PCC would be informative to clinicians, employers and health system leaders as they endeavour to support this population. As such, we conducted a cross-sectional study that evaluated health-related adverse work outcomes of individuals who had COVID-19 from the Canadian province of British Columbia (BC). Our primary objective was to determine whether individuals with a PCC history were more likely to experience health-related adverse work outcomes compared with other individuals who had COVID-19. Our secondary objectives were to determine whether a PCC history was associated with more sick days in the first 2 years postinfection and which specific PCC symptoms were associated with a greater likelihood of a health-related adverse work outcome.

METHODS

Study design and participants

In this cross-sectional study, participants were recruited by email from BC's COVID-19 Consent to Contact Registry Database (CCRD), a province-wide registry of individuals who consented to be contacted for research in the future.[47–50] All individuals in the CCRD tested positive for SARS-CoV-2 by PCR and were asked to enrol in the registry when they tested positive. Invited participants were asked to provide electronic consent and complete an online questionnaire administered using Qualtrics (Provo, Utah, USA). Participants were given individualised links to the questionnaire so that their responses could be linked to CCRD data. This also prevented them from completing the questionnaire more than once.

To be included, participants had to have tested positive for SARS-CoV-2 between 4 March 2020 and 10 May 2021 and be aged 18–64 when they tested positive. Recruitment occurred between 11 May 2023 and 24 July 2023 (at least 2 years from the test result date). Participants had until 7 August 2023, to complete the questionnaire.

As part of the questionnaire, participants were asked the month and year they had their first SARS-CoV-2 infection. To ensure that participants were referring to the same SARS-CoV-2 infection as recorded in the CCRD, we only included participants in analyses if their self-reported infection date was within 1 month of the date in the CCRD database. As our study focused on work outcomes, we excluded respondents who were not employed when they first contracted SARS-CoV-2.

Questionnaire development and recruitment procedures followed Dillman's Guiding Principles for Internet Surveys.[51] A preliminary version of the questionnaire was piloted in 42 individuals with a PCC history from the Post-COVID-19 Interdisciplinary Clinical Care Network.[52–56] We followed the Checklist for Reporting Results of Internet E-Surveys,[57] Checklist for Reporting Of Survey Studies[58] and the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.[59]

PCC and related symptoms

We classified participants as having a PCC history if they responded affirmatively to a question that asked if they had any symptoms three or more months after their first SARS-CoV-2 infection. This was specified to include symptoms from the initial infection that lasted three or more months or symptoms that developed after an initial recovery. This question was adapted from the Canadian COVID-19 Antibody and Health Survey and is consistent with the WHO and NASEM definitions of PCC.[2 3 60] Participants who answered that they had symptoms 3 or more months after their first SARS-CoV-2 infection were asked to indicate from a list which symptoms these were. Symptoms captured included shortness of breath, cough, brain fog, fever, chest pain, palpitations, anxiety or depression, headache or pain, loss of taste or smell, fatigue, and weakness.

Outcomes

Health-related adverse work outcomes

To capture information on health-related adverse work outcomes, participants were asked to indicate how their

health has impacted their work since their infection, and a list of options was presented. The health-related adverse work outcomes included change of occupation or employer, reduced workload, more sick days compared with before COVID-19, retiring earlier than planned and indefinite sick leave. As there is no consensus in the literature regarding what constitutes a health-related adverse work outcome, we developed this list based on a literature review and our clinical experience supporting people with PCC.[61–63] We acknowledge that having a 'reduced workload' could be interpreted as a positive, adaptive accommodation for reducing the likelihood of other adverse outcomes, such as symptom exacerbation and absenteeism. However, for this study, we classified this as an adverse work outcome as it indicated that PCC negatively impacted the participant's ability to work at their previous capacity. Our primary outcome was at least one health-related adverse work outcome, and each of the adverse work outcomes was evaluated individually as a secondary outcome.

Sick days

Our secondary outcome was the number of sick days in the first 2 years following COVID-19. In the questionnaire, participants employed at the time of their first SARS-CoV-2 infection were asked to indicate the number of full or partial workdays they had missed for health reasons in the 2 years following their infection.

Statistical analysis

Raking

We used raking to weight the study sample to reflect the characteristics of all adults in BC who were infected with SARS-CoV-2 between 4 March 2020 and 10 May 2021, were aged 18–64 at the time of infection and were alive at the end of questionnaire completion period. We used aggregate data from the British Columbia Centre for Disease Control COVID-19 laboratory testing dataset (see online supplemental methods) to derive study weights from marginal category totals for age (at the time of infection), sex, year of infection, regional health authority, number of vaccinations at the time of infection and COVID-19 hospitalisation.[64] Rapid antigen testing was not widely available during this pandemic period of interest, so nearly all positive tests in the province were captured by this provincial dataset. We derived the raking weights after excluding participants whose self-reported SARS-CoV-2 infection dates did not match CCRD records but before excluding respondents who were not employed at the time of infection.

Propensity score overlap weighting

After excluding respondents who were not employed at the time of SARS-CoV-2 infection, we used propensity score (PS) overlap weighting to balance the baseline characteristics of participants with a PCC history and participants without a PCC history. The PS was defined as the probability of having a PCC history versus not and was estimated using weighted multivariable logistic regression. We adopted the approach by Ridgeway *et al* to incorporate the raking weights into the model.[65]

The baseline covariates included in the weighted PS multivariable logistic regression model were ascertained from participant questionnaire responses or CCRD records (see online supplemental methods for variable definitions). Based on clinical experience and a literature review, these were prespecified as potential confounders.[66 67] They included sex, age (at the time of infection), partner status, race/ethnicity, education level, household income, acute COVID-19 severity, COVID-19 hospitalisation, regional health authority, Charlson Comorbidity Index (CCI) (current), history of depression (at the time of infection) and smoking status (at the time of infection).

Using the overlap weighting approach, we assigned participants with a PCC history a weight proportional to the probability of not having had PCC, and participants without a PCC history were assigned a weight proportional to the probability of having a PCC history.

Outcome regression models

We modelled the health-related adverse work outcomes as binary (present vs not). We used logistic regression models following PS overlap weighting to estimate adjusted ORs (aORs) between participants with a PCC history and those without a PCC history.

We compared the number of sick days between participants with a PCC history and other individuals who had COVID-19 using a two-part hurdle model following PS overlap weighting. This model was used due to the excess number of zeros.[68] The first part of the model applied logistic regression to evaluate the probability of non-zero sick days, and the second part modelled the count of non-zero sick days using truncated negative binomial regression. The mean difference in sick days between participants with a PCC history and those without a PCC history was estimated by calculating each group's expected mean sick days using the two-part hurdle model equation. We applied 100 bootstrap samplings to obtain the 95% CI of the expected mean difference in sick days.

PCC symptoms and adverse work outcomes

In the subgroup of participants classified as having a PCC history, we evaluated which of the 11 specific PCC symptoms were associated with having a health-related adverse work outcome. We generated 11 multivariable logistic regression models (one for each symptom), including the symptom of interest and the covariates listed above.

Missing data and statistical tests

We handled missing data by listwise deletion; any record with missing data for any of the covariates or outcomes was excluded from analyses. All statistical tests were two sided, with the significance threshold

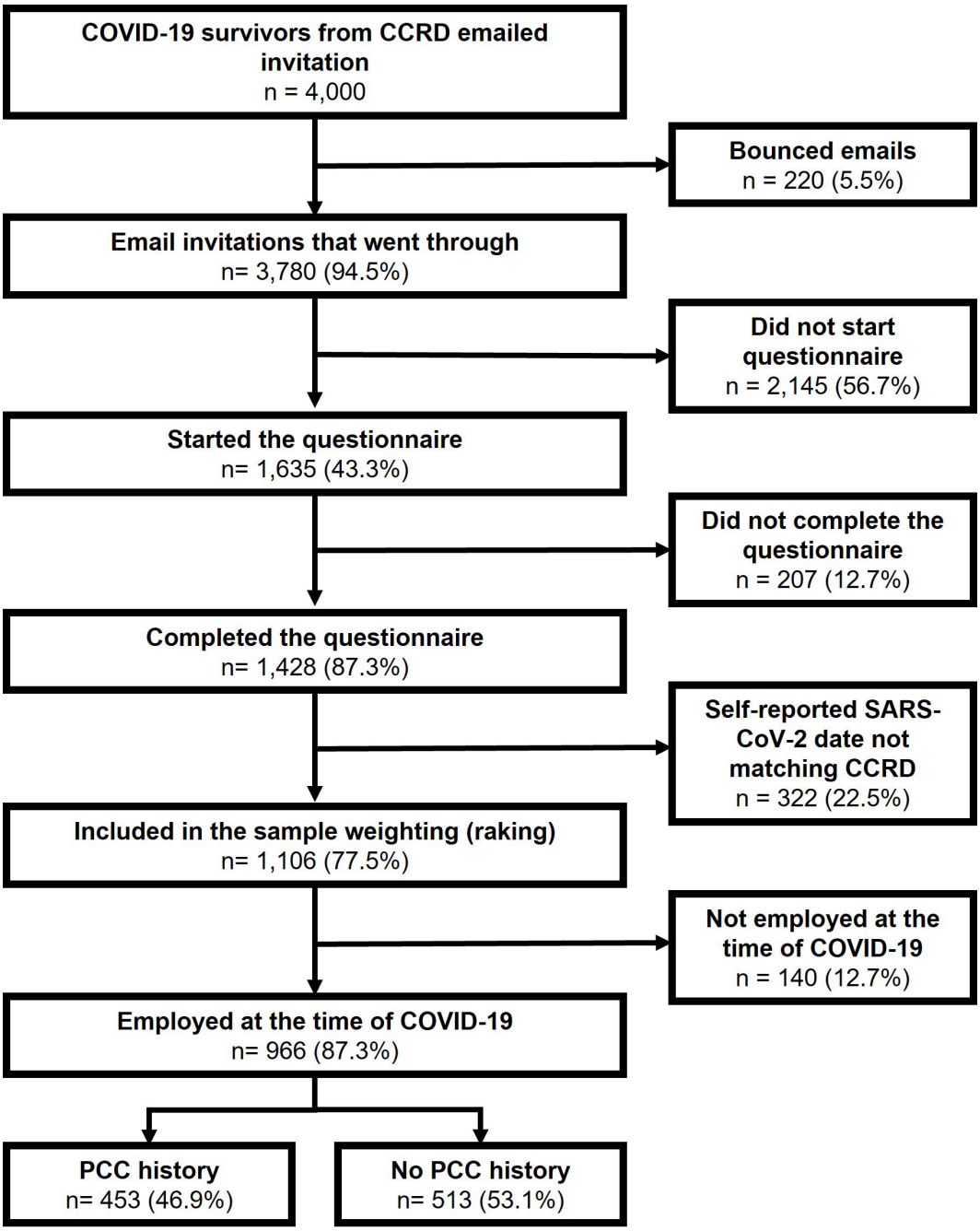

Figure 1 Participant flow diagram. This flow diagram outlines the development of the study cohort. The questionnaire response rate was 39.0% (1428/3780), and the completion rate was 87.3% (1428/1635). CCRD, COVID-19 Consent to Contact Registry Database; PCC, post-COVID-19 condition.

at $p<0.05$. Analyses were completed using R statistical software V.4.3.3.

RESULTS

Characteristics of the study population

Of the 3780 emails that went through, 1635 individuals started and 1428 completed the questionnaire (figure 1). The response rate was 39.0% (1428/3780), and the completion rate was 87.3% (1428/1635). Of the participants who completed the questionnaire, 1106 had self-reported COVID-19 diagnosis dates that matched CCRD records and were included in raking. The characteristics of participants included in raking are compared with other contacted participants in online supplemental table S1 and individuals in BC who had COVID-19 in online supplemental table S2.

Of the participants included in raking, 966 reported being employed when they contracted SARS-CoV-2 and were included in subsequent analyses. Of those included, 453 (46.9%) had a PCC history. Before PS overlap weighting, participants with a PCC history were more likely than other individuals who had COVID-19 to be

female, unvaccinated at the time of infection and have had severe acute COVID-19 (online supplemental table S3). After PS overlap weighting, all standardised mean differences across covariates were less than 0.1 (table 1; online supplemental figure S1).

Health-related adverse work outcomes

Compared with other individuals who had COVID-19, participants with a PCC history were more likely to have reported any health-related adverse work outcome since COVID-19 (aOR 2.6 (95% CI 1.7 to 4.0)) (figure 2; online supplemental table S4). Specifically, those with a PCC history were more likely to have taken more sick days compared with before COVID-19 (aOR 3.1 (95% CI 1.9 to 5.4)). Although these outcomes did not reach statistical significance, participants with a PCC history were also more likely to have reduced their workload (aOR 1.8 (95% CI 0.9 to 3.6)), retired earlier than planned (aOR 1.6 (95% CI 0.2 to 11.8)) and to have gone on indefinite sick leave (aOR 1.6 (95%CI 0.5 to 5.0)). Those with a PCC history were slightly less likely to have changed their occupation or employer, although this estimate was not statistically significant (aOR 0.8 (95% CI 0.4 to 1.6)).

Sick days

In the first 2 years since COVID-19, participants with a PCC history were more likely to report at least one sick day (83.7% vs 68.1%) and a greater number of sick days (adjusted mean difference 43 days (95% CI 20 to 65)) (table 2; online supplemental figure S2).

PCC symptoms and adverse work outcomes

Among the participants who were classified as having a PCC history, the PCC symptoms that were associated with a health-related adverse work outcome were fatigue (aOR 4.6 (95% CI 2.7 to 7.9)), fever (aOR 4.0 (95% CI 1.7 to 9.6)), weakness (aOR 3.8 (95% CI 2.2 to 6.3)), palpitations (aOR 3.3 (95% CI 2.0 to 5.0)), brain fog (aOR 3.2 (95% CI 2.0 to 5.0)), anxiety or depression (aOR 3.0 (95% CI 1.9 to 4.7)), headache or pain (aOR 2.6 (95% CI 1.6 to 4.1)) and shortness of breath (aOR 2.3 (95% CI 1.4 to 3.7)) (figure 3; online supplemental table S5). The symptoms with no statistically significant association with a health-related adverse work outcome were cough (aOR 1.6 (95% CI 1.0 to 2.6)), chest pain (aOR 1.4 (95% CI 0.7 to 2.6)) and loss of taste or smell (aOR 0.9 (95% CI 0.6 to 1.3)).

DISCUSSION

In this cross-sectional study, we examined work outcomes in individuals who had COVID-19. Our primary finding was that over 46% of participants with a PCC history reported a health-related adverse work outcome and were more likely to report a health-related adverse work outcome than other individuals who had COVID-19. This finding corroborates prior studies that used measures of work ability to indicate that people with PCC had deficits in occupational functioning.[25 69–71]

Specifically, we observed that compared with other individuals who had COVID-19, people with PCC were more likely to report an increase in sick days than before COVID-19 and reported a greater number of total sick days since their infection. Further research regarding the context and timing of this absenteeism will be required to appreciate how to support people with PCC. PCC has been described as an illness with fluctuating symptom severity and episodic disability.[72 73] We suspect many individuals with PCC had returned to work following infection but were required to take more sick days when their symptoms flared up. It is also possible that participants with PCC had longer sick leaves following their acute infection.

Notably, other secondary outcomes (decreased workload, change in occupation or employer, early retirement and indefinite sick leave) were rare and not statistically significantly more common in participants with a PCC history. The finding that decreased workload and indefinite sick leave were rare may indicate that individuals with PCC have had difficulty obtaining accommodations and prolonged sick leaves from their employers. Our findings are also consistent with other studies' observations that major occupational changes are relatively rare in PCC. For example, a longitudinal study in Switzerland observed that only 1.1% experienced an occupational change attributed to PCC.[25] Similarly, a study of over 200 000 individuals from the UK observed that prolonged labour inactivity was uncommon among those reporting PCC and concluded that PCC was unlikely to have been the major driver of labour shortages in their country.[22] That only a fraction of people with PCC become unable to work may reflect the fact that PCC is a heterogeneous illness, and there is a wide spectrum of symptoms and symptom severity.[7 74 75]

Indeed, our study identified that some symptoms of PCC were more strongly associated with health-related adverse work outcomes than other symptoms. The five symptoms with the strongest association were fatigue, fever, weakness, palpitations and brain fog. Interestingly, these symptoms are also characteristic of myalgic encephalomyelitis/chronic fatigue syndrome—a chronic disabling illness that is believed to manifest in a proportion of people with PCC.[76 77] These findings regarding PCC symptoms are also consistent with prior research indicating that fatigue is a prominent disabling symptom in PCC and research suggesting that fatigue, brain fog and palpitations are associated with reduced work ability in this population.[6 35 78 79]

Our findings are relevant for clinicians, employers and health system leaders. Clinicians should appreciate that health-related adverse work outcomes are common in the PCC population and consider including the evaluation of work-related issues in their routine PCC care. Employers of people with PCC should expect greater absenteeism from this population and be prepared to provide accommodations for symptoms like fatigue and brain fog. For health system

Table 1 Characteristics of the study population after propensity score (PS) overlap weighting

Characteristic	All N=966	PCC history N=453	No PCC history N=513	SMD
Sex				
Male	52.2%	52.2%	52.2%	
Female	47.8%	47.8%	47.8%	<0.001
Age (at the time of infection), median (IQR)	37 (28, 48)	38 (27, 47)	36 (28, 48)	<0.001
Age (at the time of questionnaire), median (IQR)	39 (30, 50)	41 (30, 50)	38 (30, 50)	0.001
Partner status				
Not married or with a partner	30.0%	30.0%	30.0%	
Married or with a partner	68.0%	68.0%	68.0%	
Prefer not to say	2.0%	2.0%	2.0%	<0.001
Race/ethnicity				
Other	39.3%	39.3%	39.3%	
White/European	60.7%	60.7%	60.7%	<0.001
University education				
No university	40.6%	40.6%	40.6%	
University	58.2%	58.2%	58.2%	
Prefer not to answer	1.1%	1.1%	1.1%	<0.001
Annual household income ($C)				
<$C50 000	12.8%	12.8%	12.8%	
$C5000–$C99 999	22.7%	22.7%	22.7%	
≥$C100 000	54.5%	54.5%	54.5%	
Prefer not to answer	10.0%	10.0%	10.0%	<0.001
Months after infection, median (IQR)	28.0 (26.0, 30.0)	28.0 (26.0, 30.0)	28.0 (26.0, 30.0)	<0.001
COVID-19 vaccinations (at the time of infection)				
0	95.8%	95.8%	95.8%	
≥1	4.2%	4.2%	4.2%	<0.001
Acute COVID-19 severity				
Not severe	59.9%	59.9%	59.9%	
Severe	40.1%	40.1%	40.1%	<0.001
COVID-19 hospitalisation				
Not hospitalised	98.6%	98.6%	98.6%	
Hospitalised	1.4%	1.4%	1.4%	<0.001
Regional health authority				
Vancouver Coastal	28.1%	28.1%	28.1%	
Fraser	60.7%	60.7%	60.7%	
Interior	9.2%	9.2%	9.2%	
Northern	1.9%	1.9%	1.9%	<0.001
Charlson Comorbidity Index (at the time of infection)				
0	81.2%	81.2%	81.2%	
≥1	18.8%	18.8%	18.8%	<0.001
History of depression (at the time of infection)				
No	87.1%	87.1%	87.1%	
Yes	12.9%	12.9%	12.9%	<0.001

Continued

Table 1 Continued

Characteristic	All N=966	PCC history N=453	No PCC history N=513	SMD
Smoking (at the time of infection)				
No	93.6%	93.6%	93.6%	
Yes	6.4%	6.4%	6.4%	<0.001

This table describes characteristics of the study population after raking (to reflect population characteristics) and propensity score overlap weighting. See online supplemental table S3 for characteristics before PS overlap weighting. Percentages represent column proportions. PCC, post COVID-19 condition; SMD, standardised mean difference.

leaders, our results point to the importance of multidisciplinary care models for people with PCC.[52 54 56] In addition to primary care and specialist physicians, successful vocational rehabilitation often requires input from social workers, occupational therapists and physiotherapists.[80] Health systems should also be aware that absenteeism from work could result in lost wages and financial challenges for those affected by PCC. These challenges may result in barriers to accessing medical care and other supports.[81–83]

Limitations and strengths

We acknowledge that our study has limitations. Although we have a temporal relationship between COVID-19 symptoms at 3 months and work status >2 years post-COVID-19 diagnosis, there is a possibility that recall of both COVID-19 symptoms and other conditions preinfection might differ across our outcome groups. In addition to this recall bias, non-response biases were also likely, resulting in those with a PCC history being over-represented. Moreover, unmeasured confounding is also possible; although our models adjusted for multiple sociodemographic and clinical covariates, these were all self-reported, and we lacked detailed clinical and occupational data. For example, we did not adjust for occupation, work hours before COVID-19, SARS-CoV-2 reinfection and development of chronic conditions following COVID-19. Lastly, we acknowledge that the WHO definition of PCC requires that other conditions be ruled out, and this was not possible for this study.[2] The NASEM definition does not have this requirement.[3]

This study also has multiple strengths. Recruiting participants from the CCRD allowed us to link questionnaire responses to clinical data captured at the time of confirmed SARS-CoV-2 infection. This approach also allowed us to be agnostic about participant PCC status during recruitment and permitted the inclusion of a diverse cohort of participants from throughout the province. This contrasts with prior studies that recruited openly from online platforms

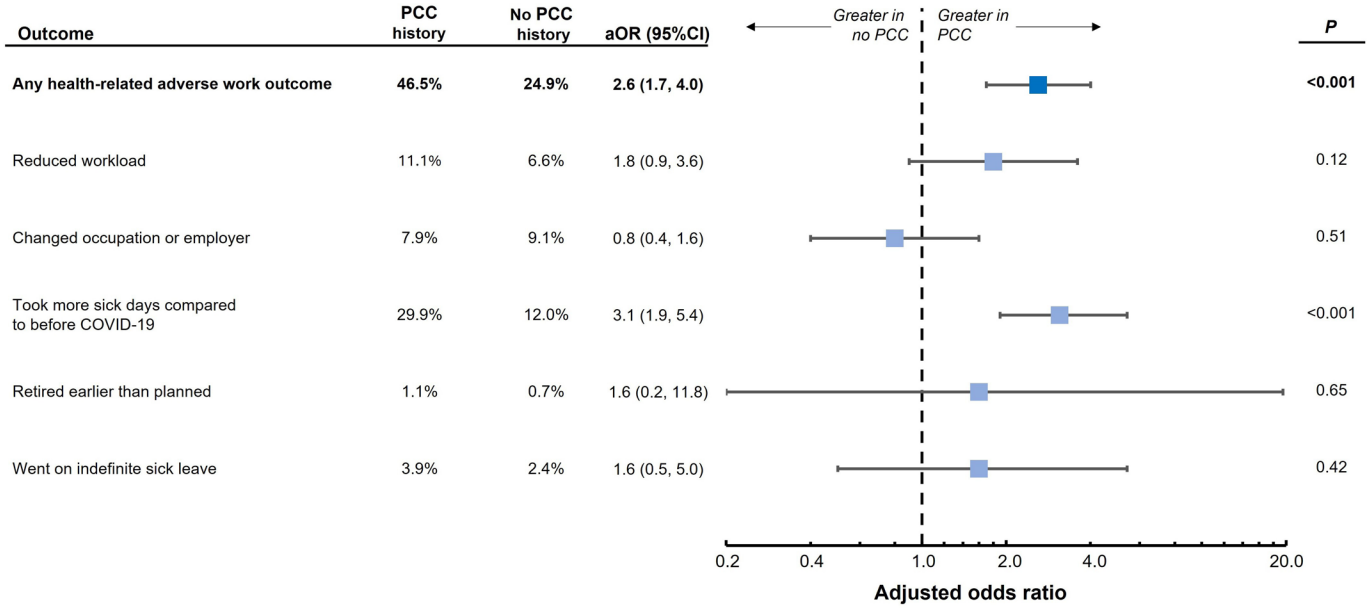

Figure 2 Health-related adverse work outcomes associated with PCC. Self-reported health-related adverse work outcomes in the first 2 years since COVID-19 are compared between those with a PCC history and those with no PCC history. The primary outcome (any health-related adverse work outcome) is bolded and is a composite measure of the individual outcomes below. aORs presented in the forest plot were derived from six separate logistic regression models (one for each outcome) after first balancing characteristics of the exposure groups using propensity score overlap weighting. In the forest plot, error bars represent 95% CIs. aOR, adjusted OR; PCC, post-COVID-19 condition.

Table 2 Sick days in the first 2 years since COVID-19

PCC status	≥1 sick day N (%)	Number of sick days Median (IQR)	Non-zero probability model aOR (95%)	Count model Estimate (95% CI)	Adjusted mean difference Sick days (95% CI)
No PCC history	308 (68.1)	7 (0, 14)	(reference)	(reference)	(reference)
PCC history	429 (83.7)	12 (5, 30)	2.4 (1.5, 3.9)	1.3 (0.9, 1.7)	43 (20, 65)

This table presents the results of our analysis comparing the number of sick days in the first 2 years since COVID-19 reported by participants with a PCC history to the number reported by those with no PCC history. After first balancing the characteristics of the groups using propensity score overlap weighting, we compared the proportion of participants who reported at least one sick day, compared the median number of sick days and derived a two-part hurdle model. The first part of the hurdle model (the non-zero probability model) involves a logistic regression model to assess the probability of a non-zero number of sick days. The second part of the model used Poisson regression to model the count of non-zero sick days. The mean difference in sick days between participants with a PCC history and those without a PCC history was estimated by calculating each group's expected mean sick days using the two-part hurdle model equation. The CI was estimated using 100 bootstrap samplings.
aOR, adjusted OR; PCC, post COVID-19 condition; SMD, standardised mean difference.

or post-COVID-19 clinics.[7 22 42] We further reduced selection biases by weighting analyses to reflect the actual population of individuals who had COVID-19 in BC and mitigated confounding using PS overlap weighting.

CONCLUSION

In conclusion, this study observed that PCC is associated with a greater likelihood of health-related adverse work outcomes, especially absenteeism. Clinicians, employers and health system leaders should consider these findings when supporting individuals with PCC.

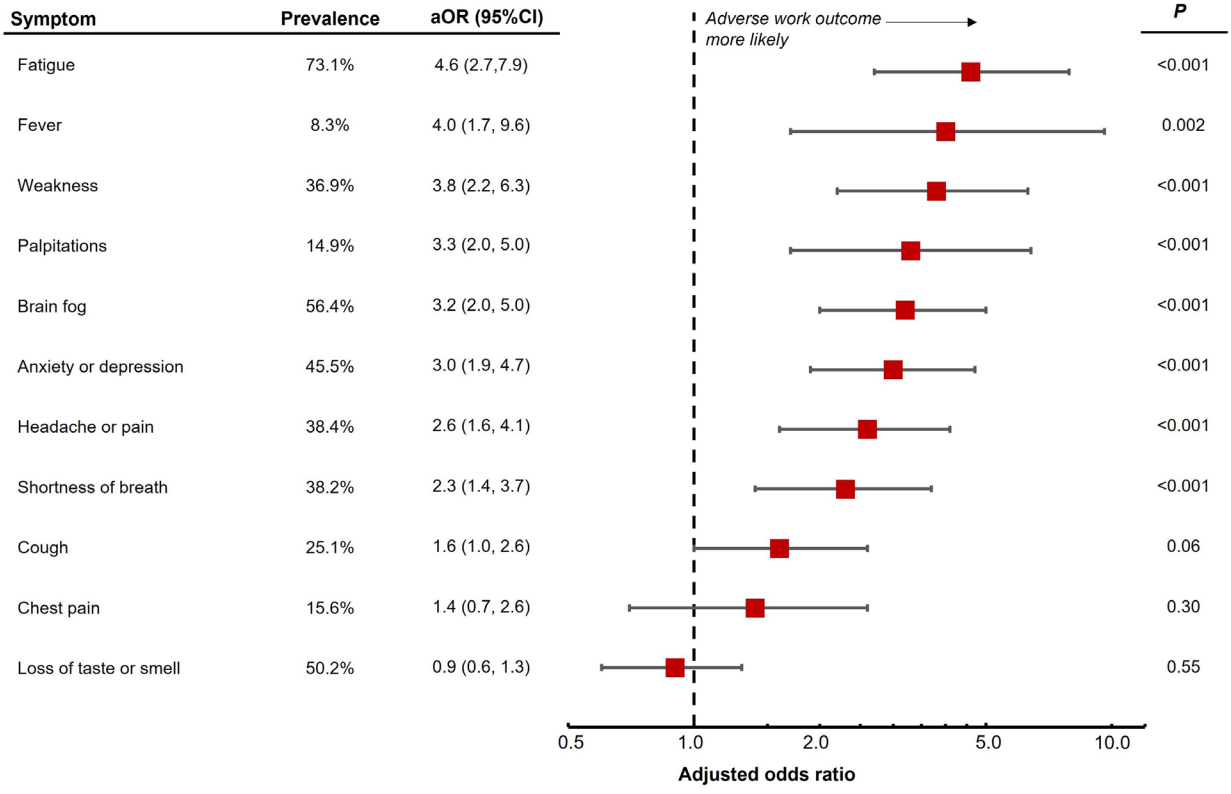

Figure 3 Symptoms associated with health-related adverse work outcomes in participants with a history of post-COVID-19 condition. This forest plot illustrates the results of our analyses examining the association between each PCC symptom and the experience of any health-related adverse work outcome among the subgroup of participants with a PCC history. aORs presented in the forest plot were derived from 11 separate multivariable logistic regression models (one for each symptom), each adjusting for sex, age (at the time of infection), partner status, race/ethnicity, education level, household income, acute COVID-19 severity, COVID-19 hospitalisation, regional health authority, Charlson Comorbidity Index (CCI) (at the time of infection), history of depression (at the time of infection) and smoking status (at the time of infection). The results of the univariate analyses for each symptom are presented in online supplemental table S5. In the forest plot, error bars represent 95% CIs. aOR, adjusted OR; PCC, post COVID-19 condition.

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