



# Gender, work-family conflict and depressive symptoms during the COVID-19 pandemic among Quebec graduate students

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## ABSTRACT

The increasing mental health inequalities between women and men following the COVID-19 crisis represent a major public health concern. Public health measures to mitigate the pandemic could severely impact populations with high prevalence of mental health problems such as graduate students. We aimed to document the gendered experience of the lockdown and its association with depressive symptoms among graduate students in Quebec. We contrast two hypotheses: whether inequalities in depressive symptoms between women and men could be linked to their differential exposure or vulnerability to work, family and study conditions, with the mediating role of work-to-family interference (WIF) and family-to-work interference (FIW). This observational study used path analysis to test our hypotheses using a cross-sectional data collected from 1,790 graduate students from three universities in Quebec. The exposure hypothesis received more support. Women reported more stress regarding new teaching methods, which was associated directly with more depressive symptoms, and indirectly through WIF. Women were more worried about COVID-19, which was associated with more depressive symptoms, and indirectly through WIF and FIW. However, women reported less FIW and more emotional support, both respectively associated with less depressive symptoms. The policy measures taken after the COVID-19 were not gender-neutral. This study demonstrates the importance of taking the potentially gendered effects of policies into consideration, and points to mitigating actions that can forestall the exacerbation of gendered inequalities in mental health.

## 1. Introduction

Since March 2020, the deleterious effects of the COVID-19 pandemic on mental health in the general population have emerged as a policy priority (Mental Health Commission of Canada, 2020). Evidence from meta-analyses indeed points to a significant increase in mental health problems prevalence such as psychological distress, depression and anxiety (Luo et al. 2020; Vindegaard and Benros, 2020). As such, some subpopulations with an already high prevalence of mental health problems, such as university students, may have been particularly affected by the pandemic (Evans et al., 2018; Sahu, 2020).

Considering that COVID-19 containment and mitigation measures will likely be necessary for several months and perhaps even years to come, mental health approaches must also be refined to respond to the needs of this situation. In particular, the mental health of women and

men were distinctively affected by the pandemic (Luo et al., 2020). In Canada, results from a national survey shows that women were more likely than men to report worse mental health since the onset of physical distancing measures (Moyser, 2020).

While the issue of equality between women and men was at the forefront of policy priorities in several jurisdictions before the COVID-19 pandemic, the public health measures enacted to contain and mitigate the pandemic were not gender-neutral (Bilodeau and Quesnel-Vallée, 2020; Wenham et al., 2020). In order for public health authorities to efficiently prevent and mitigate inequalities associated with the COVID-19, there is a pressing need to better understand how the construction of gender following the management of the pandemic could have contributed to mental health inequalities. Failing to do so would raise serious doubts about the ability of governments to limit population health inequalities between women and men during and after the

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COVID-19 pandemic. In light of this knowledge gap, this study examines the association between gendered experience of COVID-19 during the lockdown and depressive symptoms among graduate students in the province of Quebec.

## 2. Gender and mental health inequalities in the COVID-19 pandemic

The COVID-19 pandemic shapes the construction of gender and health inequalities through multiple mechanisms (Bilodeau et al., 2020a,b). According to Risman and Davis (2013), gender is a social structure that differentiates constraints and opportunities based on sex categories which have implications at multiple levels (Risman and Davis, 2013). Among others, gender is constructed through a differential exposure to risk factors (e.g., stressors) and differential access to protective factors (e.g., resources) between women and men. Government-mandated lockdowns have put tremendous pressure on Canadians' work-family conciliation capacity. Indeed, teleworking, home schooling, daycare and workplace closures shaped differently the constraints to which women and men were exposed daily. These could have increased domestic burden, financial difficulties or work-family conflict more significantly among women, which are important determinants of mental health (Collins et al., 2020; Power, 2020).

Gender could also intervene in the difference regarding the intensity of response to stressors and resources between women and men due to the different meaning and importance assigned to their social role (Bilodeau et al., 2020). According to Thoits (1991), social roles such as work and family are ordered hierarchically in individuals' identity. She suggested that stressors that threaten people's important identities are most detrimental to mental health than identity-irrelevant stressors. For example, women's mental health may be more adversely affected than men's when family issues such as problems with a child arise (Bilodeau et al., 2020).

Work-family conflict is a significant gendered determinant of mental health (Bilodeau et al., 2020; Korabik et al., 2008). This stressor highlights inter-role conflicts where the pressures from work and family are mutually incompatible (Greenhaus and Beutell, 1985). Work-family conflict is a bidirectional construct: work may interfere with family (WIF) and family may interfere with work (FIW). Understandably, given the potential gendered nature of stressors that arose out of containment and mitigation measures, many authors have called for the need to document its impact following COVID-19 (e.g., Bilodeau and Quesnel-Vallée, 2020; Sinclair et al., 2020; Venkatesh, 2020). Yet, empirical studies examining mental health consequences of work-family conflict during COVID-19 are still scarce. A study conducted in Italy found that work-family conflict was a mediator between workload and stress (Molino et al., 2020). However, in addition to not distinguishing between WIF and FIW, gender was not addressed in this study.

Although gender is intimately linked to work-family conflict, there is paradoxically no consensus as to whether men or women are more exposed to WIF/FIW (Shockley et al., 2017). Some studies have suggested that this lack of consensus stems from neglecting the gendered antecedents of WIF/FIW (Bilodeau et al., 2020; Shockley et al., 2017). This is particularly relevant considering that many of these antecedents such as working hours, financial difficulties and the workload may have been profoundly and unequally disrupted following the pandemic.

## 3. In search of work-family balance during COVID-19: The case of Canadian graduate students

The academic sectors were hard hit by lockdown measures in Canada due to COVID-19. Higher education institutions rapidly closed their doors and research activities trickled down to only the most essential for months. The human capital costs of these interventions have yet to be fully assessed, but some research points to clear concerns for equality between women and men (Malisch et al., 2020). Notably, while in-

person ground to a halt, the pandemic accelerated other processes, such as (targeted) research granting and peer review, likely exacerbating cumulative (dis)advantages between researchers with and without family responsibilities (Molino et al., 2020). To wit, article submissions, a key metric of success in a research career, has declined markedly among women compared to men (Vincent-Lamarre et al., 2020).

It is likely that graduate students and postdoctoral researchers aspiring to an academic career are at increased risks of work-family conflict generally, as they are both seeking to establish research and publication records in a highly competitive environment while also often being in the early stages of family formation (Levecque et al., 2017; Sahu, 2020). Moreover, psychosocial features of the graduate student work environment (e.g., workload, control, social support, job insecurity) may further exacerbate work-family conflict (Levecque et al., 2017). Considering the already high prevalence of mental health problems among university students, work-family conflict following the unprecedented pandemic context could be a major vector of aggravation and mental health inequality (Levecque et al., 2017; Robinson et al., 2016). Yet studies on this population during the pandemic remain sparse and rarely consider the implication of gender.

To fill this gap, this study uniquely contributes to the literature by examining the gendered model of mental health among graduate students and postdoctoral researchers from the province of Quebec. This model, presented in Fig. 1, posits that mental health inequalities between women and men result from differences in exposure and vulnerability. According to the *exposure hypothesis*, gender is a social structure that shapes stressors and resources based on sex categories. In turn, these stressors and resources derived from work/study and family will be associated with depressive symptoms both directly and indirectly through work-family conflict. Worrying about COVID-19 is associated with depression and seems a gendered experience, affecting women more than men (Fitzpatrick et al., 2020; Moyser, 2020). Thus, we postulate an indirect association between women and depressive symptoms through higher worry about COVID-19. The *vulnerability hypothesis* posits that women and men differ in the intensity of response to stressors/resources due to the different meaning and importance assigned to their social roles. In this perspective, a similar levels of exposure will be differently associated to depressive symptoms.

## 4. Methods

The cross-sectional data are drawn from the COVID-19 International Student Well-being Study, an observational study aiming to explore mental health in lockdown among students from post-secondary institutions (Van de Velde et al., 2021). We are limiting this study to the province of Quebec, as it was the only jurisdiction that fielded a questionnaire on work-family conflict. The online questionnaire (administered through Qualtrics) was distributed by email to 73,873 students from three universities in the province of Quebec between May 7 and May 27, 2020, while universities were operating entirely remotely. This study focuses on graduate students and postdoctoral researchers who are more likely to experience family responsibilities while being involved in research work. Fig. 2 presents the breakdowns of the respondent groups included into the analytic sample. A total of 4,566 university students answered the questionnaire. After listwise deletion of missing data, our analytical sample comprises 1,790 graduate students and postdoctoral researchers. The project has been approved by the ethics committee of the Faculty of Medicine of McGill University (certificate: A04-B22-20B [20-04-065]).

The low response rate observed here is not uncommon for this type of survey (Van Mol, 2017) and does not necessarily produce biased estimates (Groves, 2006). Since the proportion of women in the sample is higher than the reported enrolment statistics (Supplementary table), we created sample weights to rebalance the analytic sample to the institutions' respective reported enrolments by sex categories and level of study.

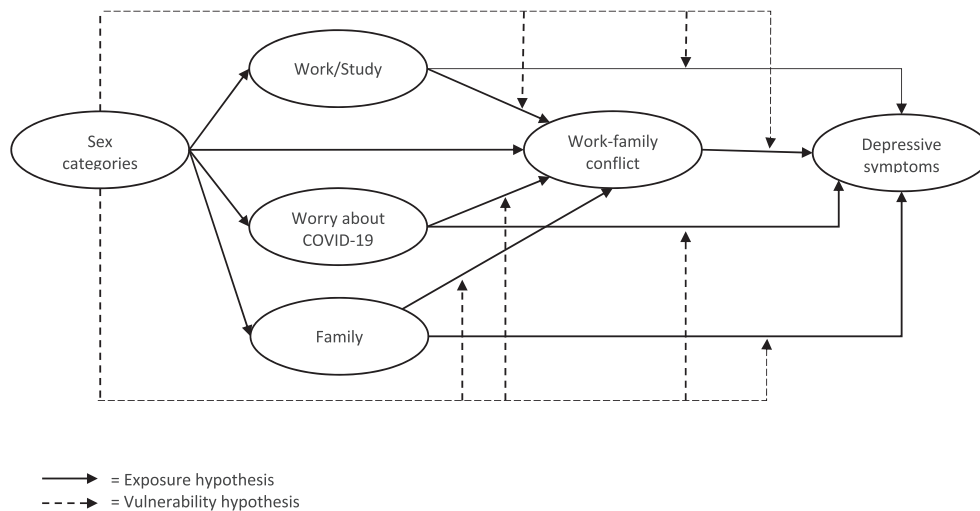


Fig. 1. Conceptual model.

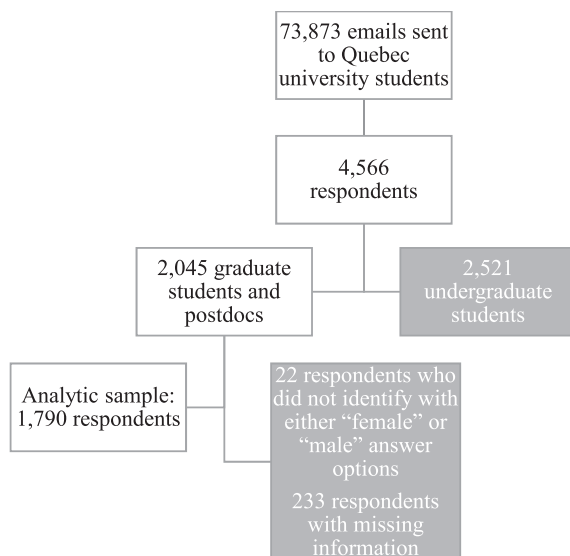


Fig. 2. Analytic sample selection.

4.1. Variables

4.1.1. Mental health

Depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale - 8 items (Van de Velde et al., 2009). This scale identifies different depressive symptoms over the past two weeks (e.g., felt depressed). Continuous score was derived by summing eight items (Cronbach's alpha  $\alpha = 0.83$ ). Responses were based on a Likert scale (1 = None or almost none of the time 4 = All or almost all the time).

**Stressors.** The number of hours devoted to paid work per week and of weekly hours devoted to studies (e.g., offline courses, online courses and personal study on a weekly basis) are continuous variables. The financial strain (e.g., "I had sufficient financial resources to cover my monthly costs"), workload ("My university workload has significantly increased since the COVID-19 outbreak"), stress with teaching methods ("The change in teaching methods resulting from the COVID-19 outbreak has caused me significant stress") were answered using a Likert scale (1 = Strongly agree – 5 = Strongly disagree). Worry about COVID-19 refers to worry that oneself or one's network may contract the virus or the lack of medical equipment in hospitals. It was obtained from summing 5 items

based on a scale from 0 to 10 (e.g., "How worried are you to get infected by COVID-19?"  $\alpha = 0.86$ ).

WIF and FIW are respectively derived from five items each, which were validated by Netemeyer et al. (1996): e.g. for WIF ( $\alpha = 0.92$ ) "The demands of my work interfere with my home and family life," and for FIW ( $\alpha = 0.93$ ) "The demands of my family or spouse / partner interferes with work-related activities". Responses were based on a scale from 0 (Strongly disagree) to 10 (Strongly agree).

4.1.2. Resources

Emotional support was obtained from the item: "Do you have anyone with whom you can discuss any intimate and personal matters?" (No = 0 – Yes = 1).

Sociodemographic variables include sex categories (Men = 0 – Women = 1), age in years, marital status (Single = 0 – Couple = 1) and the presence of children living at home (No = 0 – Yes = 1).

4.2. Analysis

We performed a path analysis with Mplus 7.3 (Muthén and Muthén, 2012) to test the exposure and the vulnerability hypotheses. This technique allows to introduce several dependent variables and to estimate direct and indirect relationships adjusted for all the other relationships in a model (Tabachnick and Fidell, 2013). The validity of the models can further be assessed using multiple criteria such as the root mean square error of approximation (RMSEA) and the comparative fit index (CFI), with a RMSEA < 0.06 and a CFI > 0.95 suggesting a good fit of the model with the data (Tabachnick and Fidell, 2013). The significance of the indirect relations was tested using the model constraints method, which produces standard errors and p-values computed from the z-distribution, allowing for the estimation of indirect relations with 95% confidence interval. Indirect relations were calculated as indirect =  $a \times b$ , where  $a$  represent the regression coefficient for the relationship between the independent variable and the mediator, while  $b$  represent the regression coefficient for the relationship between the mediator and the dependent variable. The indirect relations were tested only when coefficient  $a$  and  $b$  were significant. In addition, the bootstrap method with 5000 resamples was used to obtain the coefficient intervals for the indirect relationships (Preacher and Hayes, 2008). Analyses were also adjusted for age since it is potentially related to mediators and depressive symptoms (Bilodeau et al., 2020).

A significant indirect association of sex categories with depressive symptoms through stressors or resources will support the exposure hypothesis. The weighted least squares parameter estimates method of estimation was used to test the differential exposure hypothesis

considering the presence of categorical dependent variables (Muthén and Muthén, 2012). This estimator uses a probit regression link for categorical variables and a linear regression for continuous variables.

In turn, the vulnerability hypothesis was tested by stratifying the model by sex categories. This hypothesis will be confirmed when the direct or indirect association differ significantly between women and men. A z-test was performed using the formula of Clogg et al. (1995) to test whether the relationships were significantly different between women and men.

### 5. Results

Descriptive statistics are presented in Table 1. There were no differences in depressive symptoms between women and men. Women reported higher levels of worry about COVID-19, tended to be more frequently in couple, worked more paid hours, reported more stress regarding teaching methods, more emotional support, less FIW and were younger than men.

Table 2 presents results for the exposure hypothesis. The fit indices indicate a good fit of the model with the data. These findings align with the descriptive results in Table 1 for the differences in exposure except for hours of study and WIF. Hours of study were significantly higher while WIF was significantly lower among women. Regarding associations with depressive symptoms, having children, hours of study as well as emotional support were associated with less depressive symptoms. Financial difficulties, stress with teaching methods, worries about COVID-19, WIF and FIW were linked to significantly more depressive symptoms.

Gendered stressors and resources are also likely to modulate mental health through work-family conflict. Being in a relationship, having children, having financial difficulties, stress with the teaching methods and worry about Covid-19 were linked to more WIF and FIW, and conversely for emotional support. Moreover, study hours and workload were related to more WIF while working hours were associated with more WIF and less FIW.

Several indirect associations presented in Table 3 and Fig. 3 were significant. Women reported less WIF, FIW and more emotional support, which were associated with fewer depressive symptoms. On the other hand, they reported greater worries about COVID-19 and more stress with the teaching methods, which were in turn associated with more depressive symptoms. The higher stress with new teaching methods among women was also indirectly linked to more depressive symptoms through WIF while worry about COVID-19 was indirectly linked to more

**Table 1**  
Descriptive statistics.

	Women (n = 1185)		Men (n = 605)	
	Mean/%	SD	Mean/%	SD
<b>Outcome</b>				
Depressive symptoms	9.05	0.14	9.05	0.20
<b>Stressors and resources</b>				
Couple*	60.5%		55.2%	
Child at home	13.5%		13.2%	
Financial difficulty	2.13	0.03	2.24	0.05
Hours of study (week)	23.79	0.52	25.32	0.74
Working hours (week) *	6.30	0.34	5.13	0.48
Workload	2.65	0.03	2.61	0.04
Stress teaching method**	3.06	0.04	2.84	0.05
Emotional support**	91.8%		82.2%	
Worry about COVID-19**	28.17	0.34	24.92	0.50
<b>Work-family conflict</b>				
Work-to-family conflict	17.84	0.39	18.37	0.55
Family-to-work conflict**	12.33	0.38	14.11	0.56
<b>Individual</b>				
Age*	28.55	0.20	29.27	0.31
Sex categories (women)	100%		0%	

Note: t-test between women and men \* $p \leq 0.05$  \*\* $p \leq 0.01$ .

**Table 2**  
Regression coefficients of direct relationships from path analysis for the exposure hypothesis.

	Depressive symptoms	WIF	FIW	Effect of sex category (women) on
Couple	-0.28	2.00**	3.21**	0.16*
Child at home	-0.79*	4.85**	6.44**	0.11
Financial difficulty	0.53**	1.45**	1.02**	-0.10
Hours of study (week)	-0.02*	0.13**	0.05	-1.24*
Working hours (week)	-0.02	0.11**	-0.08*	1.25*
Workload	-0.19	2.33**	0.98	0.04
Stress teaching method	0.73**	1.24**	0.46	0.22**
Emotional support	-1.05**	-1.35*	-1.81**	0.47**
Worry about COVID-19	0.07**	0.30**	0.28**	3.26**
Work-to-family conflict	0.05**			-1.63**
Family-to-work conflict	0.06**			-2.63*
Sex (women)	0.36	-1.63*	-2.63**	
<b>Goodness-of-fit</b>				
CFI	0.977			
RMSEA	0.054			

Note: \* $p \leq 0.05$  \*\* $p \leq 0.01$ .

**Table 3**  
Indirect regression coefficients of sex categories on depressive symptoms for exposure hypothesis.

Sex categories (women)	Coefficient	SE	95% percentile bootstrap confidence intervals
Stress teaching method	0.156**	0.049	[0.063;0.264]
Emotional support	-0.492**	0.135	[-0.809;-0.249]
Worry about COVID-19	0.233**	0.060	[0.122;0.363]
WIF	-0.086*	0.050	[-0.212;-0.008]
FIW	-0.154*	0.070	[-0.327;-0.048]
Couple - WIF	0.017	0.010	[0.000;0.041]
Working hours (week) - WIF	0.007	0.004	[0.000;0.018]
Stress teaching method - WIF	0.014*	0.006	[0.004;0.030]
Emotional support - WIF	-0.034	0.018	[-0.076;0.000]
Worry about COVID - WIF	0.052**	0.017	[0.023;0.092]
Couple - FIW	0.030*	0.015	[0.005;0.068]
Working hours (week) - FIW	-0.006	0.004	[-0.017;0.000]
Stress teaching method - FIW	0.006	0.005	[-0.002;0.017]
Emotional support - FIW	-0.050*	0.022	[-0.100;-0.012]
Worry about COVID-19 - FIW	0.053**	0.018	[0.023;0.098]

Note: \* $p \leq 0.05$  \*\* $p \leq 0.01$ . Bootstrap sample = 5000.

depressive symptoms through WIF and FIW. Women were more likely to have emotional support which was indirectly related to less depressive symptoms through FIW. Women were also more likely to be in relationships, which is indirectly associated with more depressive symptoms via the FIW.

Table 4 presents the results of the vulnerability hypothesis. Considering that the vulnerability models are just adjusted, the model fits are not available. Among both women and men, having children and emotional support were associated with fewer depressive symptoms. In



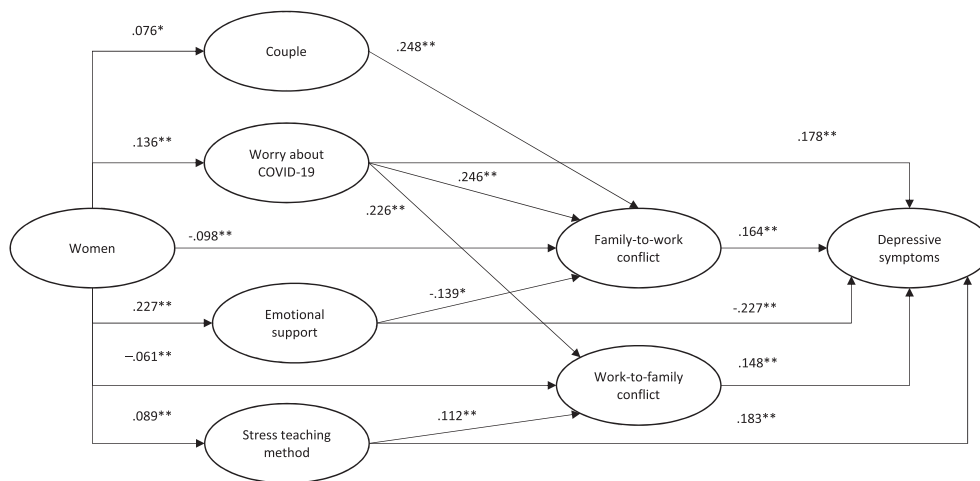


Fig. 3. Standardized effects of gendered pathways to depressive symptoms. Only statistically significant coefficients are displayed (\* $p \leq 0.05$  \*\* $p \leq 0.01$ ).

**Table 4**  
Regression coefficients of direct relationships from path analysis for the vulnerability hypothesis.

	Depressive symptoms		WIF		FIW	
	Men	Women	Men	Women	Men	Women
Couple	-0.28	-0.90**	1.65	2.24**	4.63**	1.36 ††
Child at home	-1.48**	-1.51**	5.94**	10.10**	11.66**	16.71**†
Financial difficulty	0.64**	0.64**	1.70**	1.41**	0.72	1.25**
Hours of study (week)	-0.01	-0.01	0.06	0.08**	-0.05	-0.02
Working hours (week)	-0.01	-0.03**	0.10*	0.10**	-0.12*	-0.06*
Workload	-0.21	0.01	1.92**	2.45**	1.03	0.78*
Stress teaching method	0.90**	0.65**	1.83**	1.28**	0.96*	0.74*
Emotional support	-2.39**	-1.51**	-0.93	-0.11	-0.36	-2.10
Worry about COVID-19	0.06**	0.09**	0.26**	0.24**	0.26**	0.20**
Work-to-family conflict	0.06**	0.03*				
Family-to-work conflict	0.03	0.05**				

Note: Within group significance \* $p \leq 0.05$  \*\* $p \leq 0.01$ . Between groups difference significance (men vs women) †  $p \leq 0.05$ ; ††  $p \leq 0.01$ .

contrast, financial difficulties, stress relating to teaching methods, WIF, and worries about COVID-19 were all directly associated with more depressive symptoms. Among women only, being in a couple and the number of hours worked were associated with fewer depressive symptoms, while FIW was associated with more depressive symptoms. However, no direct (Table 4) or indirect (Table 5) relationship with depressive symptoms differed significantly between women and men.

**6. Discussion**

The main objective of this study was to examine the gendered experience of work-family conflict during the COVID-19 pandemic on depressive symptoms among graduate students and postdoctoral researchers from the province of Quebec. We carried out path analysis to

test for the exposure and vulnerability hypotheses. Our analyses give more credence to the exposure hypothesis.

Surprisingly, the descriptive statistics do not show a difference in depressive symptoms between women and men. This contrasts with an abundant literature observing a higher prevalence of depressive symptoms among women in the general population (Cavanagh et al., 2017). However, our preliminary analyses (not shown) suggested a potential suppressor effect, as the relationship between being a woman and depressive symptoms becomes significant when controlling for WIF/FIW. Thus, the positive direct association between being a woman and depressive symptoms could be cancelled by a negative indirect association through WIF/FIW. This has important implication for public policy. Since gender is a social structure, we must avoid the trap of thinking that no statistical difference at first sight means that there are no underlying gender inequalities (Connell, 2012).

This study makes several contributions to the literature. First, it provides a unique snapshot on how COVID-19 confinement and mitigation measures in Quebec could have contributed to gendered mental health inequalities. Of importance to university administrators, women reported more stress related to adapting to new remote teaching methods. This was associated with more depressive symptoms, not only in a direct association, but also indirectly through WIF. New remote teaching methods thus appear to be perceived as interfering with family responsibilities among women (Malish et al., 2020).

Second, women also reported more worry about COVID-19, which is directly associated with increased depressive symptoms, and indirectly through both WIF and FIW. To our knowledge, this is the first study to document the relation between worry about COVID-19 and depressive symptoms inequality through WIF/FIW. Our results echo the suggestion that the difference between women and men regarding attitude toward risk is linked to the care work responsibilities generated by the COVID-19 pandemic (Umamaheswar and Tan, 2020). Considering that a large proportion (women = 37%, men = 27%) had a close contact who had contracted COVID-19, the mental load or the time of care linked to this concern could have had an unfavorable effect on the capacity to reconcile work and family responsibilities among women.

Third, women reported less WIF/FIW and more emotional support than men, which were associated with lower depressive symptoms. Furthermore, the higher emotional support among women was indirectly linked to less depressive symptoms through less FIW. Emotional support was a valuable gendered resource that may have mitigated the deleterious effect of the lockdown on mental health. The fact that these gendered stressors and resources operate in different directions may lead us to overlook how they can contribute to (re)produce mental health inequalities; while stressors and resources indeed appear in this sample to balance each other out, it may not be the case in other groups

**Table 5**  
Indirect regression coefficients of work stressors and personal resources on depressive symptoms for the vulnerability hypothesis.

	Women			Men		
	<i>b</i>	SE	95% percentile bootstrap CI	<i>b</i>	SE	95% percentile bootstrap CI
Couple- WIF	0.070	0.039	[0.008;0.158]	0.104	0.075	[-0.027;0.237]
Child at home - WIF	0.317*	0.138	[0.056;0.600]	0.377*	0.165	[0.106;0.743]
Financial difficulty - WIF	0.044*	0.022	[0.007;0.093]	0.108*	0.044	[0.035;0.188]
Working hours (week) - WIF	0.003	0.002	[0.000;0.007]	0.006	0.004	[0.000;0.014]
Workload - WIF	0.077*	0.034	[0.013;0.147]	0.122*	0.050	[0.038;0.233]
Stress teaching method - WIF	0.040*	0.020	[0.006;0.082]	0.116**	0.043	[0.042;0.208]
Hours of study - WIF	0.002	0.001	[0.000;0.005]	0.004	0.002	[0.000;0.009]
Worry about COVID-19 - WIF	0.021**	0.004	[0.014;0.029]	0.017**	0.005	[0.007;0.028]
Couple - FIW	0.073	0.042	[-0.004;0.164]	0.146	0.089	[-0.011;0.343]
Child at home - FIW	0.898**	0.225	[0.475;1.356]	0.367	0.210	[-0.029;0.805]
Working hours (week) - FIW	-0.003	0.002	[-0.007;0.000]	-0.004	0.003	[-0.010;0.000]
Workload - FIW	0.041*	0.021	[0.005;0.086]	0.032	0.025	[-0.006;0.089]
Financial difficulty - FIW	0.067**	0.025	[0.024;0.124]	0.023	0.022	[-0.008;0.076]
Stress teaching method - FIW	0.040*	0.020	[0.006;0.082]	0.030	0.024	[-0.004;0.086]
Worry about COVID-19 - FIW	0.018**	0.004	[0.011;0.025]	0.016**	0.005	[0.008;0.028]

Note: Within group significance \**p* < 0.05; \*\**p* < 0.01. Between groups difference significance (men vs women) † *p* ≤ 0.05; †† *p* ≤ 0.01. Bootstrap sample = 5000.

in society.

It also invites us to think of mental health through the lens of greater exposure to specific stressors and lack of resources among men. The higher predominance of FIW and lower support among men have already been reported in Quebec (Bilodeau et al., 2020a,b). Thus, this result highlights the deleterious consequences of the lockdown on men’s mental health as well. A possible explanation could lie in gendered management of boundaries between roles (Shockley et al., 2017; Sinclair et al., 2020). Men could see the boundary between roles as more segmented, which could exacerbate difficulties in the context of the severe lockdown that was in effect in Quebec during the data collection, as these boundaries were effectively abolished. Our paper reiterates the importance of considering both WIF and FIW on mental health and mental health inequalities, especially during a pandemic with lockdown measures.

Some limitations need to be addressed. First, the cross-sectional data does not allow establishing a causal relationship between the variables. However, we can assume that the sex categories precede the other variables. Second, it is difficult to predict whether those who felt more severely affected by the pandemic would be more or less inclined to respond to the survey. Although the study was conducted on a large sample, the response rate was low, though not unexpectedly so given this method of data collection (Shih and Fan, 2009). In addition, our survey came on the heels of a Statistics Canada pan-Canadian crowd-sourcing survey among university students, which raises the possibility of survey fatigue. Third, it is impossible to generalize the results to all graduate students in Quebec as the result are derived from only three universities. Nevertheless, the universities are very distinct on several points including culture, size, region, programs and language of instruction. Also, since the Montreal metropolitan area suffered a distinctly more severe COVID-19 first wave than the rest of Quebec, the results could differ between the respondents from the Montreal university and other universities. However, the size of the sample did not allow to test this. Although sensitivity analyses show that the results remain unchanged when controlling for study cycle, it would be relevant to further explore this model stratified by study cycles in future studies. Finally, working in an essential service or losing a job were highly gendered experiences that could act as potential confounders in this study, but these data were not available.

Despite these limitations, this study offers several contributions to the literature on the gendered processes in mental health inequalities. It identifies action levers aimed at containing the inequalities during the pandemic such as adapting and extending support for distance education methods that consider familial obligation, proactive and generalized mental health support approaches, and also refined policies for reconciling work and family. To our knowledge, this is the first study to

document in such detail the mechanisms linking gendered stressors and resources, WIF/FIW and mental health in the context of a pandemic. In addition to demonstrating the importance of such an approach for subsequent studies, it highlights that the response to the pandemic was not gender-neutral. Universities and governments should consider these results to reduce the risk of depression and mental health inequality during a pandemic.

**CRedit authorship contribution statement**

**Jaunathan Bilodeau:** Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Visualization, Funding acquisition. **Amélie Quesnel-Vallée:** Conceptualization, Investigation, Data curation, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Nancy Beauregard:** Conceptualization, Writing – review & editing, Funding acquisition. **Marie-Christine Brault:** Investigation, Writing – review & editing.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2021.101568>.

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