

Research

COVID-related stressors, psychological distress and social support in Atlantic Canadian University students

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Abstract

This study explores the impact of the COVID-19 pandemic on Memorial University of Newfoundland (MUN) undergraduate and graduate students. Using the National College Health Assessment (third revision) (NCHA-III) survey, the relationship between COVID-related stressors and mental health was assessed after controlling for demographic, economic, and academic variables, and reported mental illness. A hierarchical regression revealed that psychological distress was higher for students who were undergraduate, female, of lower family income, with a pre-existing anxiety or depressive disorder. Psychological distress was also predicted by *direct* COVID stressors (e.g., fear of infection), as well as *indirect* stressors, including worries about employment and tuition, professor/instructor support, campus efforts to ensure safety, and discrimination/hostility due to race/ethnicity. Chi Square tests subsequently revealed that graduate students were more likely to be concerned about the threat COVID-19 posed to loved ones, separation from family/friends, and pandemic duration, while undergraduates were more likely concerned about returning to school, tuition, employment, and the legitimacy of their degree. Undergraduates were also more likely to have witnessed discrimination/hostility, and less likely to report professor/instructor support. Finally, independent t tests revealed that undergraduate students were significantly lower in overall social support, as well as for particular subdomains including ‘guidance’, ‘social integration’, and ‘reassurance of worth’. Interpretation of the findings and implications are considered.

Keywords COVID-related stressors · Psychological distress · Social support · University students

1 Introduction

Research exploring the impact of coronavirus disease 2019 (COVID-19) and ensuing global public health emergency has examined direct (e.g., health risk concerns due to virus exposure) [1–5], and indirect stressors such as fears raised by misinformation (e.g., [3, 6, 7]), as well as economic hardship (e.g., [1, 8, 9]), and social isolation (e.g., [6, 9]) resulting from widespread restrictions and lockdowns. To date, adverse mental health consequences have been consistently revealed (e.g., [3, 10–13]), including high rates of psychological distress, anxiety, depression, post-traumatic stress disorder [7], eating disorders, (e.g., [14]), and suicidality (e.g., [15]).

Studies further indicate that the pandemic’s influence has not been homogeneous in the general population (e.g., [3, 7, 16]), with psychological distress risk, for instance, observed to be particularly evident among women and

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healthcare workers, as well as those in younger age groups (e.g., [3]), and of lower income (e.g., [9]). Investigations also indicate that specific racial and ethnic minorities have experienced relatively poorer physical and mental health outcomes [17–19], with COVID-related discrimination in particular, being linked to heightened psychological distress [20, 21].

Postsecondary students have also been identified to be particularly vulnerable for poorer mental health and to date, several investigations have been conducted to explore how, and the degree to which various college and university public health protocols might have influenced learner wellbeing and success (e.g., [22–24]). Accordingly, the current study was designed to explore various direct and indirect COVID-related stressors on student mental health at an Atlantic Canadian university.

1.1 COVID-19 public health responses on university and college campuses

When it became evident that postsecondary campuses were particularly precarious for COVID-19 transmission, colleges and universities throughout North America brusquely and completely locked down during March 2020, rapidly switching classes and services to online delivery, and directing students to immediately vacate campus residences [25]. While initially considered a temporary public health response, as COVID-19 cases increased, varying forms of campus restrictions extended well into the 2020/21 academic year, resulting in prolonged and distinctive stressors for students (e.g., [23–25]).

In terms of COVID-19 infection threat, despite evidence that younger adults tend to be at lower risk for severe health outcomes (e.g., [5]), research reports testing positive to be a significant predictor of psychological distress among college students [26]. Such findings are also consistent with several studies reporting an association between testing positive and poor mental health in the general population, with more severe illness predictive of higher psychological distress levels (e.g., [4]).

Prior to the initial COVID-19 outbreak, depression, anxiety, and suicidality prevalence rates among postsecondary students were already worrisome, so concerns that the pandemic would further compromise mental health were warranted (e.g., [23, 27]). In Canada, for instance, a 2019 national survey of 55,284 students found that 24.2 percent reported academic difficulties due to depression while 34.6 percent reported academic difficulties due to anxiety [28]. Two years after the COVID-19 outbreak, a follow-up administration of the survey revealed that academic challenges associated with both depression and anxiety independently rose by nearly 10 percent [29]. Such findings are consistent with other studies that have observed the pandemic to be a significant predictor of depression, anxiety, insomnia, and self-harm symptomology in postsecondary students [3, 30–33].

Campus closures not only prevented students from experiencing the learning benefits of interacting with their professors, instructors, and peers in class, but also from receiving supports from friends and loved ones, which studies reveal has been predictive of poorer coping (e.g., [34, 35]), and higher depression and anxiety symptoms (e.g., [36, 37]). Additionally, perceived social support has been found to buffer the connection between concerns about COVID-19 and psychological health [38], and to be positively associated with online self-regulated learning and online learning self-efficacy [39, 40]. Such findings are particularly salient as adjusting to remote learning was challenging for many [24, 25], with evidence to suggest that students who could *only* avail of online curriculum were at greater risk for increased psychological distress than those who were able to access a mixture of in-person and virtual classes [41].

Economically, campus closures also resulted in significant financial strain for students (e.g., [26, 33]) who often rely on their universities for employment opportunities [30]. In Canada, for instance, findings from the Labour Force Survey revealed that among post-secondary students aged 20 to 24 years, the employment rate fell from 52.5 percent in February 2020 to 28.9 percent in April 2020, with 70 percent of respondents feeling ‘very’ or ‘extremely’ concerned about the impact the pandemic could have on their financial stability [42]. Studies also found that the COVID-19 pandemic significantly affected entry into the job market, particularly for students in the last years of their academic programs [43].

Studies involving postsecondary students have also noted a mental health toll from COVID-related discrimination. For instance, Macaranas et al. (2022) observed that the association between COVID-19-related discrimination and distress was particularly evident among Hispanic, Asian, and students of mixed-race after controlling for other socio-demographic characteristics and pre-existing mental illness diagnoses [44]. Their findings also indicated a predictive link between ‘vicarious discrimination’ (i.e., an experience in which an individual learns of, or witnesses another person facing racism) and psychological distress [44].

1.2 Impact of COVID-19 on undergraduate vs. graduate students

Postsecondary students face a variety of distinct challenges as they transition to, and experience campus life [45], including increased responsibilities, financial worries, and academic overload [46], interpersonal issues [47], and reduced capacity to self-regulate emotions (e.g., [48]), and coping resources such as social support (e.g., [49, 50]). Moreover, relative to graduate students, research suggests that undergraduate students may be more vulnerable to postsecondary life and academic stressors, and hence, at risk for poorer mental health (e.g., [51]).

Based on studies exploring the impact of the COVID-19 pandemic on postsecondary student mental health, it would seem that such pre-existing undergraduate susceptibility might have intensified its influence. For example, Liu et al. (2022) reported that undergraduate students in their study were at higher risk for (and reported more days of) poorer mental health, demonstrated less capacity to manage stress, and experienced more negative emotions than graduate students [52]. Similarly, Dial et al. (2021) found that, relative to graduate students, undergraduate students reported higher levels of perceived stress, more negative rumination, and less positive mood during the pandemic [53]. Additionally, some studies suggest that undergraduate students may have been more vulnerable to school-related stressors caused by the pandemic such as adjusting to distance learning [54], having less professor support/assistance [53], as well as lower social support, which has been predictive of higher levels of depression, anxiety, and stress (e.g., [36]).

1.3 The current study

For the current study, the case of Memorial University of Newfoundland (MUN), the Canadian province's only university is featured based on data extracted from the Spring 2021 administration of the American College Health Association National College Health Assessment, third revision (ACHA-NCHA-III) survey. During data collection, campus access remained under COVID-19 restrictions following a closure imposed during March 2020, with the majority of course instruction and student services delivered remotely [55]. Despite the fact that Newfoundland and Labrador (NL) was deemed at significant risk for a surge in COVID-19 cases during the summer of 2022 [56], the number of active COVID cases during the spring of 2021 remained under 20, with thousands of residents receiving their first dose of the COVID vaccine [57]. A uniqueness of the current study therefore, is that it assesses student mental health at an Atlantic Canadian university during a time when community COVID-19 transmission risk was relatively low, yet public health measures enacted by the institution were significant. Moreover, is it the only known study to assess various COVID-related stressors, and social support (overall and by subdomain) by undergraduate and graduate student status.

Accordingly, the first aim of the current study was to investigate whether, and the extent to which various COVID-related stressors predicted psychological distress in a sample of students after controlling undergraduate/graduate status, international student status, family income, full or part time status, gender, as well as a pre-existing anxiety or mood disorder diagnosis. Secondly, undergraduate and graduate students were assessed in terms of concerns over several COVID-related stressors such as COVID infection, spending time with loved ones, pandemic duration, professor/instructor supportiveness, campus effort to protect students, direct and vicarious discrimination/hostility, as well as returning to school, affording tuition, degree quality, and future employment. Finally, undergraduate and graduate students were compared in terms of social support (overall and by particular subdomain including 'Attachment', 'Guidance', 'Reliable alliance', 'Social integration', and 'Reassurance of worth').

Based on previous studies, it is expected that psychological distress will be higher for students who are at the undergraduate level (e.g., [52]), female (e.g., [3, 38]), of lower income (e.g., [9]), and with a pre-existing anxiety or depressive disorder (e.g., [23]), and will be predicted by concerns over COVID-19 contagion, as well as worries over employment (e.g., [26]), tuition (e.g., [30]), experiencing discriminatory or hostile behavior (e.g., [44, 58, 59]), and lower professor/instructor support (e.g., [37]).

Relative to graduate students, and in light of previous research (e.g., [26, 30]), it is expected that undergraduate students will be more likely to express concerns about returning to school, employment, affording tuition (e.g., [53]), and *less* likely to report the supportiveness of professors/instructors (e.g., [53]). In terms of social support, congruent with previous research (e.g., [36]), we expect lower levels among undergraduate students, but since no research exists assessing potential differences in subdomains, we have no predictions in this regard.

2 Methods

2.1 Data source and sample

Data for this study were taken from the Spring 2021 administration of the NCHA-III survey which captures sociodemographic, academic, social, and health status/conditions/behaviour variables, as well as items pertaining to COVID-19 experiences and concerns [60]. Ethics approval to conduct the survey was obtained through the Newfoundland and Labrador Health Research Ethics Board (HREB). Each student enrolled during the Spring 2021 semester (i.e., a total of 10,858 individuals) was invited to participate anonymously by email. To incentivize survey completion, participating students were given an opportunity to have their names drawn to win one of several laptops or campus parking permits. Overall, 2,294 students participated in the survey, resulting in a response rate of 21.1 percent, with 762 (34.6 percent) identifying as male and 1436 (65.4 percent) identifying as female, and an average age 26.0 years ($SD = 7.742$).

2.2 Measures

2.2.1 The Kessler psychological distress scale (K10)

The Kessler 10 psychological distress scale (K10) was used to assess student psychological distress [61]. The scale consists of 10 items and asks respondents 'During the past month, how often did you feel...' with responses being, 'worthless?', 'tired out for no good reason?', 'nervous?', 'so nervous that nothing could calm you down?', 'hopeless?', 'restless or fidgety?', 'so restless you could not sit still?', 'depressed?', 'that everything was an effort?', 'so sad that nothing could cheer you up?', and 'worthless?' with responses on a 5-item scale ranging from 0 (none of the time) to 4 (all of the time). Total scores range between 0 and 40, with higher values indicating more distress. The Cronbach's alpha coefficient derived for the K10 for the current sample was 0.938 indicating excellent internal validity and reliability.

2.2.2 Testing positive for COVID-19

As a direct COVID-related stressor, students were asked to indicate whether they had ever been diagnosed with COVID-19 with response options ranging among 1—'Yes (confirmed by a test)', 2—'Maybe (e.g., I have had symptoms consistent with COVID-19, but it was not confirmed by a test)', 3—'Probably not (no symptoms or other reason to think I have had it)', and 4—'No (confirmed by negative test)'. Respondents were also asked whether they '...had a loved one, close family member, or friend die due to COVID-19?' with response options being 1—'Yes', and 2—'No'.

2.2.3 Concerns over testing positive for COVID-19, loved one's risk for infection, being separated from others, and the future

Several COVID-related questions were posed to students to assess direct COVID-related concerns via the standard query, 'Over the past 30 days, on average, how much have you been concerned with the following?', with specific statements including 'That you will get COVID-19', 'That someone you care about will get COVID-19', 'That someone you care about will die from COVID-19', 'How long the COVID-19 pandemic will last', and 'Not being able to spend time with people you care about'. Responses for each item ranged between 1—'Not at all concerned' and 5—'Extremely concerned'.

2.2.4 Concerns over COVID-19 impact on academic program affordability and future career

To assess indirect COVID-19 stressors such as continuing with academic programs and affordability, as well as future prospects for career, students were provided a standard query, i.e., 'How concerned are you about each of the following potential impacts of the COVID-19 pandemic for you', with the items 'I will not be able to return to school next term', 'I will have difficulty paying for tuition next term', 'My degree will not be considered equivalent to those whose studies

were not affected by COVID-19, and 'I will not have prospects for a job in the near future.' Response options for each item ranged between 1—'Not at all concerned' and 5—'Extremely concerned'.

2.2.5 Support from professors and instructors

In order to gauge perceived involvement of educators with their classes during campus closure, perceptions of professor/instructor support were assessed with the question, 'How supportive have your professors and instructors been for you during the COVID-19 pandemic?' Response options for this item ranged from 1—'Very unsupportive,' to 5—'Very supportive'.

2.2.6 Perceived campus effort to protect students from COVID-19

To generally assess the perceived efficacy of public health protocols enacted by the university, student opinions of their university's effort to protect students were captured with the question 'I believe that my campus has done enough to protect students from COVID-19.' Response options ranged between 1—'Strongly disagree' to 5—'Strongly agree.'

2.2.7 Direct and vicarious discrimination

Experiences with both direct and vicarious COVID-related racial/ethnicity discrimination were captured using the statements 'As a result of the COVID-19 pandemic, have you experienced any discriminatory or hostile behavior due to your race/ethnicity (or what someone thought was your race/ethnicity)?', and 'As a result of the COVID-19 pandemic, have you witnessed (online exchanges or in-person) any discriminatory or hostile behavior or exchanges towards others due to their race/ethnicity, or what someone thought was their race/ethnicity?' Student response options for these items were 1—'Yes' or 2—'No'.

2.2.8 The social provisions scale 10 Items (SPS-10)

Perceptions of student social support were examined via the Social Provisions Scale (SPS-10) [62], a 10-item instrument posing two statements assessing five discrete social support dimensions including 'Attachment' (i.e., 'the perception of emotional closeness with others'); 'Guidance' (i.e., 'a sense that one feels others are available to provide advice or information'); 'Reliable alliance' (i.e., 'degree of reliance on others during times of distress'); 'Social integration' (i.e., 'a sense of belonging to individuals or groups'); and 'Reassurance of worth' (i.e., 'a belief that one's competence is acknowledged by others'). For each statement, responses are provided on a scale between 1—'Strongly agree' and 4—'Strongly disagree', with an overall SPS-10 ranging between 0 and 40. Larger overall SPS-10 and subscale values indicate higher levels of overall social support [62]. The Cronbach's alpha coefficient derived for the SPS-10 for the current sample was 0.937 indicating excellent internal validity and reliability.

2.2.9 Sociodemographic, economic and academic variables

Undergraduate or graduate student status—To categorize respondents as either an undergraduate or graduate student, the 'year in school' item was redefined such that those enrolled between the first and fifth year of undergraduate studies were coded 1—'Undergraduate' while those enrolled as a 'masters' or 'doctorate' were coded 2—'Graduate'.

Age—Age was captured a categorical variable (i.e., 'Less than 25 years' or '25 years and older') and used in a two-factor Chi square analysis (See Table 1). It was also captured as a continuous variable reflecting a value in years. As a note, due to the high correlation between undergraduate and graduate student status and age ($r=0.515$, $p<0.001$), student status was used in lieu of age in the hierarchical regression model (see Table 2).

Gender—In the NCHA (III), student gender was captured by means of three discrete categories. Specifically, if one's identity matched their 'sex at birth', with 'no' indicated for 'transgender', the respondent was coded as 1—'Female', 2—'Male'. However, if the respondent indicated 'yes' for transgender, and/or 'sex at birth' was not consistent with gender identity, then the variable was coded as 3—'Non-Binary'. As the frequency of those identifying as non-binary was less than 50 respondents (i.e., approximately 2 percent of the sample), it was decided to use students' biological sex (i.e., female/male) to represent gender for all analyses.

Table 1 Age group, gender identity, international student status, enrolment status, racial/ethnic identification, and mental health/psychological disorder diagnosis percentages and frequencies by undergraduate and graduate student

	Percent (N)		χ^2	<i>p</i>	<i>Cramer's V</i>
	Student				
	Undergraduate (N = 1379)	Graduate (N = 908)			
Age					
Less than 25 years	81.6 (1112)	17.2 (155)	914.4	<0.001	0.635
25 years and older	18.4 (251)	82.8 (748)			
Sex/Gender					
Female	63.3 (873)	62.0 (563)	8.7	0.034	0.062
Male	32.3 (446)	34.8 (316)			
International Student Status					
No	76.6 (1055)	58.9 (534)	81.2	<0.001	0.189
Yes	23.4 (322)	41.1 (373)			
Enrolment Status					
Full-time	84.4 (1160)	80.7 (731)	8.0	0.018	0.059
Part-time	14.3 (196)	18.4 (167)			
Racial/Ethnic Identification					
Arab	2.9 (40)	2.2 (20)	1.0	ns	0.021
Black	6.5 (90)	9.1 (83)	5.4	0.021	0.048
Chinese	2.7 (37)	6.4 (58)	18.9	<0.001	0.091
Filipino	0.4 (5)	0.7 (6)	1.0	ns	0.021
Japanese	0.1 (1)	0.4 (4)	3.4	ns	0.039
Korean	0.2 (3)	0.1 (1)	0.3	ns	0.013
Latin American	1.6 (22)	2.6 (24)	3.1	ns	0.037
South Asian (e.g., Indian, Pakistani)	10.7 (147)	12.0 (109)	1.0	ns	0.021
Southeast Asian (e.g., Vietnamese)	1.1 (15)	1.1 (10)	0.0	ns	0.001
West Asian (e.g., Iranian, Afghan)	0.8 (11)	5.7 (52)	49.7	<0.001	0.147
White	71.7 (989)	57.4 (521)	50.2	<0.001	0.148
Other	3.0 (42)	3.6 (33)	0.6	ns	0.016
Ever diagnosed chronic condition—Mental health/Psychological Disorder					
Anxiety Disorder	31.9 (436)	24.6 (221)	14.2	<0.001	0.079
Depressive Disorder	23.7 (323)	20.3 (183)	3.6	ns	0.040

International Student Status—For the present study, students were asked their ‘citizenship status’ whereby a code of 1 indicated ‘Canadian citizen’ and 2, ‘Study permit holder’ (i.e., non-Canadian resident). It is important to note that this variable makes a distinction between students from nations outside Canada even if they required to indicate they are temporary Canadian residents for tax purposes. Furthermore, some Canadian citizens may not reside in Canada but are enrolled in online courses in NL.

Enrolment status—Student enrolment status captured whether respondents were either a 1—‘Full-time’ or 2—‘Part-time’ student.

Racial/Ethnic Identification—Student race/ethnicity was captured by means of the query ‘What is your racial or ethnic identification?’ with several distinct items representing either ‘Arab’, ‘Black’, ‘Chinese’, ‘Filipino’, ‘Japanese’, ‘Korean’, ‘Latin American’, ‘South Asian’, ‘Southeast Asian’, ‘West Asian’, or ‘Other’. A code of 0 indicated the item was ‘not selected’ and 1 indicated the item was ‘selected’.

Ever diagnosed with anxiety and/or depression—A diagnosis of an anxiety and/or depressive disorder was captured for the present study via the items (a) ‘Ever diagnosed chronic condition—Anxiety (for example: Generalized Anxiety, Social Anxiety, Panic Disorder, Specific Phobia) mental health/psychiatric disorder’ and/or (b) ‘Ever diagnosed chronic condition—Depression (for example: Major depression, persistent depressive disorder, disruptive mood disorder)’ with a either a 1—‘No’ or 2—‘Yes’ response.

Table 2 Summary of hierarchical regression analysis for variables predicting student psychological distress

Variable	Block 1		Block 2				Block 3		
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	<i>B</i>
Undergrad/Graduate	−2.939	0.421	−0.158**	−2.514	0.382	−0.135**	−2.023	0.351	−0.109**
International student	0.277	0.464	0.014	1.627	0.425	0.081**	−0.711	0.426	−0.035
Total Family Income	−0.371	0.078	−0.106**	−0.134	0.072	−0.038	−0.092	0.066	−0.026
Approximate GPA	−0.784	0.482	−0.035	−0.962	0.436	−0.043	−0.583	0.400	−0.026
Enrolment Status	0.081	0.069	0.026	0.028	0.062	0.009*	0.033	0.056	0.010
Gender	−2.094	0.426	−0.110**	−0.608	0.393	−0.032	−0.021	0.359	−0.001
Anxiety Diagnosis				3.489	0.507	0.176**	2.873	0.462	0.145**
Depression Diagnosis				6.598	0.541	0.305**	5.656	0.495	0.262**
Perceived COVID-19 impact									
Ever had COVID							−0.690	0.224	−0.054*
Concerned will get COVID							0.155	0.184	−0.019
Loved one will get COVID							0.238	0.247	0.033
Loved one died of COVID							0.905	0.605	−0.028
Loved one will die from COVID							0.602	0.154	0.093**
Not be able to return to school							0.247	0.151	−0.035
Difficulty paying tuition							0.540	0.169	0.072*
Degree will not be equivalent							0.128	0.166	−0.018
No prospects for a job							0.904	0.170	0.120*
Professors/instructors support							−0.385	0.137	−0.051*
Campus protected students							−0.489	0.199	−0.044*
Exp'd discrim./hostile beh							−2.397	0.673	−0.066**
Witnessed discrim./hostile beh							−0.618	0.338	−0.034
Not spend time w/loved one(s)							0.072	0.159	0.010
R^2			0.038			0.214			0.356
<i>F</i> for change in R^2			15.05**			73.63**			51.69**

* $p < 0.05$ ** $p < 0.001$

Approximate grade point average (GPA)—To estimate academic achievement/success, respondents were asked to provide their approximate grade point average (GPA) with the following codes: 1—'A+'; 2—'A'; 3—'A−'; 4—B+; 5—'B'; 6—'B−'; 7—'C+'; 8—'C'; 9—'C−'; 10—'D+'; 11—'D'; 12—D−'; and, 13—'F'.

Total family income—Family income was assessed via the item 'What was your total family income before taxes last year?' with specific categories coded as 1—'0 to \$29,999'; '30,000 to \$59,999'; 3—'\$60,000 to 89,999'; 4—'\$90,000 to 119,999'; 5—'\$120,000 to 149,999'; 6—'\$150,000 or more'.

2.3 Statistical analyses

NCHA-III data were analyzed using version 27.0 of the Statistical Package for the Social Sciences (SPSS). First, a series of two-factor Chi square tests were conducted for the sociodemographic/mental health variables (i.e., age, gender, international student status, enrolment status, racial/ethnic identification, and ever diagnosed with anxiety disorder or depressive disorder) to determine whether responses were dependent on undergraduate or graduate student status.

Second, a hierarchical multiple regression was conducted to explore whether various COVID-related factors predicted student psychological distress (i.e., K10) after controlling for demographic, economic, and academic variables, and a previous diagnosis of anxiety and/or depressive disorder. Specifically, variables related to undergraduate or graduate status, international student status, enrolment status, approximate GPA and gender were entered in block 1, previous diagnosis of anxiety and/or depression was entered in block 2, while variables reflecting various COVID-related stressors including whether the respondent ever had COVID-19, concerns that the respondent or a loved one would get COVID-19, or that a loved one died, or would die from COVID-19 were entered

in block 3 along with other variables which reflected concerns over not being able to return to school, difficulty paying tuition, perceptions of a non-equivalent degree, lack of job prospects, perceived professor/instructor supportiveness, perceived campus effort to protect students, discriminatory or hostile behaviour based on race/ethnicity experienced or witnessed, and not being able to spend time with loved ones.

Third, to explore whether undergraduate and graduate students status was related to COVID-related stressors, a series of two-factor Chi square tests were conducted assessing concerns over COVID-19 infection, inability to spend time with loved ones, perceptions of how long the pandemic would last, supportiveness of professors/instructors, perceived campus effort to protect students, and whether discriminatory or hostile behavior due to race/ethnicity was experienced or witnessed. Undergraduate and graduate students were also assessed in terms of the frequency with which they reported worries over returning to school, paying tuition, perceived degree equivalency, and future prospects for work.

Finally, independent t tests were conducted to compare undergraduate and graduate students in terms of perceived social support (i.e., the SPS-10) overall, and by each subdomain (i.e., 'attachment', 'guidance', 'reliable alliance', 'social integration', and 'reassurance of worth').

3 Results

Table 1 summarizes percentages and frequencies for undergraduate and graduate students by age, gender, international student status, enrolment status, racial/ethnic identification, and pre-existing anxiety/depressive disorder diagnoses. As indicated in the table, Chi Square results revealed that undergraduates were more likely to be less than 25 years, female, Canadian residents, enrolled full-time, identify as White, and report a diagnosis of an anxiety disorder. Graduate students however, were more likely to identify as Black, Chinese, or West Asian (See Table 1).

3.1 Predicting student psychological distress as a function of COVID-Related stressors

The results of a hierarchical regression analysis examining an association between COVID-related stressors and psychological distress after controlling for demographic, academic, and mental health variables are presented in Table 2.

Higher psychological distress was predicted by undergraduate student status, lower family income, and being female in block 1, accounting for 3.8% of the variance ($p < 0.001$). In block 2, undergraduate/graduate student status and total family income remained inversely predictive of psychological distress, while international student status, as well as a pre-existing anxiety and depressive disorder diagnosis also emerged as significant, positive predictors, accounting for an additional 17.6% of variance ($p < 0.001$).

In block 3, undergraduate/graduate status, and diagnosis of an anxiety and depressive disorder remained predictive of student psychological distress, while several COVID-related factors also emerged as significant predictors, accounting for an additional 14.2% of the variance ($p < 0.001$). Specifically, higher psychological distress was predicted by whether COVID-19 was previously contracted, concerns that a loved will die from COVID-19, as well as worries over paying tuition, future job prospects, lower perceived professor/instructor supportiveness, inadequate campus effort afforded to protect students, and discrimination/hostile behaviour due to race/ethnicity (see Table 2).

3.2 Comparing undergraduate and graduate student concerns over COVID-19 and related stressors

To investigate whether COVID-19-related concerns varied based on undergraduate/graduate student status, a series of two-factor Chi square tests were performed. According to Table 3, results subsequently indicated that graduate students were more likely to be 'slightly/moderately' concerned that their loved one would die of COVID-19, more likely to be 'very/extremely' concerned over not being able to spend time with love ones, and concerned how long the COVID-19 pandemic would last. Undergraduate students however, were less likely to 'strongly agree/agree' that their campus had done enough to protect students from COVID-19, that professors and instructors had been supportive, and more likely to report witnessing discriminatory or hostile behavior due to someone's race/ethnicity (see Table 3).

Table 3 Percentages and Frequencies of concerns over COVID-19 infection, inability to spend time with loved ones, pandemic duration, perceived campus effort to protect students, supportiveness of professors/instructors, and experienced or witnessed discriminatory or hostile behavior due to your race/ethnicity for undergraduate and graduate students

	Percent (N)		χ^2	P	Cramer's V
	Student				
	Undergraduate (N = 1379)	Graduate (N = 908)			
Concerned will get COVID-19					
Slightly/Moderately	55.5 (752)	57.1 (505)	1.7	ns	0.027
Very/Extremely	12.8 (174)	13.6 (120)			
Concerned loved one will get COVID-19					
Slightly/Moderately	50.7 (698)	52.0 (470)	5.2	ns	0.048
Very/Extremely	36.3 (499)	37.1 (336)			
Concerned loved one will die from COVID-19					
Slightly/Moderately	43.2 (594)	46.0 (417)	10.1	0.039	0.066
Very/Extremely	30.5 (420)	29.1 (264)			
Concerned not able to spend time with love ones					
Slightly/Moderately	41.6 (573)	43.0 (389)	25.6	<0.001	0.106
Very/Extremely	43.2 (595)	48.7 (440)			
Concerned how long the COVID-19 pandemic will last					
Slightly/Moderately	55.2 (760)	51.0 (463)	21.3	<0.001	0.097
Very/Extremely	35.4 (487)	43.4 (394)			
Campus has done enough to protect students from COVID-19					
Strongly Agree/Agree	81.3 (1118)	83.1 (752)	11.8	0.019	0.072
Strongly Disagree/Disagree	4.1 (57)	3.2 (29)			
How supportive have professors and instructors been during the COVID-19 pandemic?					
Very Supportive/Supportive	66.8 (813)	78.3 (637)	120.7	<0.001	0.230
Very Unsupportive/Unsupportive	11.3 (137)	8.6 (70)			
Experienced discriminatory or hostile behavior due to race/ethnicity?					
Yes	6.2 (85)	8.2 (74)	3.2	ns	0.038
Witnessed discriminatory or hostile behavior due to race/ethnicity race/ethnicity?					
Yes	50.3 (692)	41.9 (380)	15.6	<0.001	0.083

Cells will not total to undergraduate and graduate sample Ns since not all response categories are reported

Table 4 Percentages and Frequencies of concerns about returning to school, paying for tuition, perceived degree equivalency, and future prospects for work as a result of the COVID-19 pandemic for Undergraduate and Graduate Students

Potential Impact of COVID-19	Not at All/Somewhat Concerned		Very/Extremely Concerned		χ^2	p	Cramer's V
	Undergrad	Graduate	Undergrad	Graduate			
Won't be able to return to school next term	81.3 (1041)	88.4 (673)	18.7 (240)	11.6 (88)	125.1	<0.001	0.236
Have difficulty paying for tuition next term	79.4 (1040)	84.3 (677)	20.6 (270)	15.8 (127)	57.1	<0.001	0.160
My degree will not be considered equivalent	78.9 (1018)	85.3 (666)	21.2 (273)	14.7 (115)	91.2	<0.001	0.203
Won't have prospects for a job in future	70.4 (921)	71.4 (583)	29.6 (387)	28.6 (234)	28.3	<0.001	0.113

Cells will not total to undergraduate and graduate student sample Ns since not all response categories are reported

According to Table 4, two-factor Chi Square tests revealed that undergraduate students were more likely to be 'very/extremely' concerned that they wouldn't be able to return to school the following semester, have difficulty paying tuition, their degree would not be considered equivalent, and they wouldn't have prospects for a job in future.

Table 5 Overall Social Provision Scale (SPS) and subtype means and standard deviations for undergraduate and graduate students

Variable	Undergraduate (N = 1379)		Graduate (N = 908)		Sig	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Overall Social Provision Scale	34.75	4.84	35.30	4.68	*	−0.115
Attachment	6.95	1.14	7.04	1.10	<i>ns</i>	−0.081
Guidance	7.06	1.12	7.18	1.08	*	−0.103
Reliable Alliance	7.13	1.01	7.20	1.02	<i>ns</i>	−0.106
Social Integration	6.63	1.19	6.74	1.16	*	−0.093
Reassurance of Worth	6.74	1.19	6.90	1.12	**	−0.137

* $p < 0.05$; ** $p < 0.01$

3.3 Comparing undergraduate and graduate student social support

As presented in Table 5, an independent sample *t* test revealed that undergraduate students had a significantly lower overall SPS-10 scores compared with graduate students, $t(2053) = -2.56, p = 0.010$, as well as significantly lower scores for 'guidance', $t(2195) = -2.37, p = 0.018$; 'social integration', $t(2135) = -2.12, p = 0.035$; and 'reassurance of worth', $t(2188) = -3.14, p = 0.002$ subscales of the SPS-10 (see Table 5).

4 Discussion

The current study utilized a regression analysis to explore whether various direct and indirect COVID-related stressors predicted university student psychological distress, while Chi Square tests assessed whether concerns over COVID-related stressors varied based on undergraduate/graduate student status. Finally, *t* tests were conducted to compare perceived social support (overall, and by subdomain) between undergraduate and graduate students. Overall, the findings revealed that psychological distress was predicted by sociodemographic and economic factors, pre-existing mental illness, and various direct and indirect COVID-related stressors. Moreover, undergraduate and graduate students varied in perceptions of COVID-related stressors, as well as differed in social support, overall and by subdomain.

4.1 COVID-related factors and psychological distress

Congruent with previous studies, psychological distress was observed to be higher among undergraduate students (e.g., [52, 53]), students who were female (e.g., [3, 38, 63]), and of lower family income (e.g., [3, 9]). Additionally, students reporting a pre-existing anxiety or depressive disorder were more likely to report higher psychological distress, a finding also reflected in previous research (e.g., [23, 27, 29]).

In block 2 of the regression, and congruent with previous studies, various COVID-19-related stressors were predictive of student psychological distress, including *direct* concerns of testing positive, and that a loved one would die from the virus (e.g., [26]), as well as several *indirect* stressors such as concerns over future employment (e.g., [26, 43, 54, 64]), and affording tuition (e.g., [30]). Higher psychological distress was also revealed for those reporting lower levels of professor/instructor support. Studies conducted prior to the pandemic have found higher quality faculty support linked with better wellbeing among first-year students (e.g., [65]), and based on research featuring undergraduate researchers during COVID-19, greater social support was reported to be protective, particularly for males and first generation students, leading to the contention that faculty have an obligation to support student mental health (i.e., [37]).

However, while studies indicate that educators were concerned about their students during the pandemic, they also experienced significant negative impacts in terms of their own work-related stress (e.g., [66]). Certainly, an immediate and tedious shift to online course delivery was not an easy process for faculty and students (e.g., [24]), which likely involved significant redesign of course curriculum, and remote delivery to potentially large virtual classes, accommodating students in different time zones and geographic areas. Indeed, studies have observed that faculty members were at higher risk for mental illness when encountering challenges using IT for virtual courses (e.g., [67]). Similarly, studies

have revealed several barriers to the implementation e-learning such as deficient resources and preparedness, and poor infrastructure (e.g., [25]), as well as challenges modifying online assessment protocols (e.g., [68]). It is also notable that many educators were also required to teach from their homes with studies reporting poorer mental health as a function of contending with personal chronic illness and/or that of a loved one, as well as parenting children while delivering curriculum remotely (e.g., [69]). It is clear that robust efforts are not only vital to safeguard educator mental health, but essential to ensure they are equipped to meet the demands of teaching and supporting students in the event of campus closures.

An interesting finding of the present study was a significant, inverse relationship between perceived campus effort afforded to ensure safety and student psychological distress. Moreover, it is notable that only 5 percent of students in the present study indicated disagreement (i.e., 'strongly disagree' or 'disagree') with the statement 'I believe that my campus has done enough to protect students from COVID 19', implying encouraging perceptions of the university's protective measures. In the present case, perhaps promotional efforts to keep students well-informed of COVID-19 protocols were efficacious in helping ease student distress. The university's successful shift to innovative and accessible virtual medical and mental health counselling appointments, and campus vaccine and rapid testing clinics may also have enhanced students' sense of institutional support.

Consistent with previous research (e.g., [44, 58]), students who reported experiencing discriminatory or hostile behavior due to their race/ethnicity as a result of the COVID-19 pandemic were also more likely to report higher psychological distress. Such a finding may also be reflected research reporting associations between social isolation, social media use, and cyberbullying among university students during the pandemic (i.e., [59]). In the present study, seven percent of the sample reported enduring such behaviour, with a notable proportion identifying as 'Asian', a finding reminiscent of research reporting a mental health toll associated with discriminatory actions experienced by members of this community (e.g., [70, 71]).

Although *witnessing* COVID-related discrimination did not emerge as a significant predictor of student psychological distress, it is both noteworthy and troubling that 47 percent of students affirmed this item. For universities with a prominent international enrolment, such findings certainly speak to the importance of protecting and supporting students vulnerable to race/ethnicity discrimination.

4.2 Exploring undergraduate and graduate student concerns over COVID-19 related stressors

In the present study, the fact that undergraduate/graduate student status remained predictive of psychological distress in block 3 of the regression suggests that it likely moderated concerns over COVID-related factors. Accordingly, it was observed that graduate students were more likely to express worries that their loved ones would die of COVID-19, they would not being able to spend time with loved ones, and how long the pandemic would last. It is worth noting that a higher proportion of graduate students were international students, perhaps more sensitized to issues around global COVID-19 transmission rates, efficacy differences in national public health protocols, and international travel restrictions prolonging separation from loved ones. It is also pertinent that international students in the current sample were significantly more likely to report that a loved one, close family member, or friend had died from COVID-19.

Compared with graduate students, undergraduate students were more likely to express concerns about returning to school, affording tuition, and future employment, findings consistent with other studies (e.g., [26, 30]). Perhaps undergraduates may have been more vulnerable to such worries as anticipating a delay in the progression of academic programs would likely mean added financial burden, as well as an eventual 'bottlenecking' of post-pandemic graduates competing for vocational opportunities not accessible during widespread lockdowns and restrictions.

Undergraduates were also more likely to indicate concern that their degree would not be considered equivalent, a finding reflected in studies reporting that undergraduate students may have been more susceptible to school-related stressors such as difficulties adjusting to remote learning (e.g., [54]). Indeed, when students were forced into cyber classrooms under drastic and unproven conditions, there was a likely notion of inferior course quality and rigor (e.g., [25]), the potential for less comprehensive/reliable assessments and evaluations (e.g., [68]), and prevailing thinking that student preparedness upon graduation might be perceived as conspicuous by potential employers (e.g., [25]).

While undergraduate and graduate students were equally likely to report discriminatory or hostile behavior due to race/ethnicity, it was observed that undergraduates were more likely to have *witnessed* it. Perhaps such a finding may be interpreted in research exploring a social isolation among students during the pandemic, more likely among undergraduate students (e.g., [36]), and subsequent social media use, perhaps increasing the probability for cyberbullying

(i.e., [59]). Similarly, it was noted that undergraduates were *less* likely to agree that their professors/instructors were supportive, a finding that is consistent with previous studies (e.g., [53]).

Given a likely greater level of social isolation among undergraduates (e.g., [36]), a comparison with graduate students in terms of social support was conducted revealing that undergraduate students were significantly lower in perceived overall social support (i.e., the SPS-10), and particularly in terms of 'guidance' (i.e., 'a sense that one feels others are available to provide advice or information'), 'social integration' (i.e., 'a sense of belonging to individuals or groups'), and 'reassurance of worth' (i.e., 'a belief that one's competence is acknowledged by others'). While these novel observations may simply reflect greater vulnerability among undergraduate students in adjusting to postsecondary life (e.g., [51]) as they seek advice, a sense of belonging, and/or validation from their professors, instructors, and peers, it could also mean that the pandemic served to compromise social worlds of undergraduate more than graduate students. Indeed, future research could explore whether overall levels of social support, and that of 'guidance', 'social interaction' and 'reassurance of worth' continue to differ between graduate and undergraduate students post pandemic, when undergraduate students have been able to return and adapt to university life in-person. Moreover, subsequent studies could also explore whether/which social support subdomains might be predictive of psychological distress, particularly by undergraduate/graduate status.

5 Conclusion

While COVID-19 contagion and illness concerns were predictive of student psychological distress, the public health protocols enforced by the university also had a mental health cost in terms of financial strain, issues with e-learning, and potential for discrimination/hostility. Moreover, the mental health toll was particularly pronounced for undergraduates, who were more likely to report worries about academic careers, future employment, and lower social support. Navigating the COVID-19 pandemic was unique for universities, particularly given the distinct life challenges, and significant international diversity among students. As such, higher education serves as a special case study into the social, financial, and mental health impact of the pandemic.

5.1 Limitations

We acknowledge several limitations of this study. Firstly, although all students registered for the spring 2021 semester were invited to participate in the survey, systematic differences may exist between respondents and non-respondents resulting in the potential for sampling bias. Secondly, there are likely other important COVID-related psychological distress predictors that our study did not explore. Thirdly, given that all measures were self-reported, there is the potential for recall bias and/or misinterpretation of items. Fourthly, given the cross-sectional nature of the study, and the fact that it is not an experimental study, the directionality nor causality associations among variables could not be assessed. Consequently, any language implying direction or causation is completely unintended. Finally, since there was no NCHA-III item requesting student geographical location while completing the survey, it is impossible to determine whether respondents were located within NL, and hence influenced by aspects of local COVID-19 public health protocols, and/or infection risk.

5.2 Implications

On May 5th 2023, the WHO declared that the COVID-19 pandemic was no longer a global health emergency, but cautioned that the emergence of a subsequent, more lethal pathogen exists. Given this, the first line of defense will likely require a public health response of lock downs, restrictions, personal distancing/hygiene practices, etc. to help contain contagion, and allow for the development of a medical response (i.e., vaccines).

In the postsecondary realm, students will again be forced from campuses, with classes and services rapidly switched to virtual delivery. Based on previous research, and findings of the present study, some actions appear feasible to lessen the mental health toll, e.g., (1) control/reduce virtual class sizes by adding more sections, and providing supplementary instructional resources (e.g., teaching assistants) to improve communication between students and professors/instructors, make course delivery workload more manageable, and reduce the probability of discriminatory/hostile behaviors among students, (2) devise/enhance student financial aid initiatives to counteract distressing student economic instability, (4) prioritize and reinforce virtual medical and mental health services and ensure that virtual accessibility methods are

clearly disseminated, (5) keep students abreast of public health protocols in a timely, consistent, and well-disseminated manner, and (6) pay particular attention to students transitioning from secondary school, e.g., develop specialized communications, allow early access to university virtual academic and health, and mental health supports.

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Data availability Data may be made available upon reasonable request.

Declarations

Ethics approval and consent to participate Approval was obtained from the Newfoundland and Labrador Health Research Ethics Board (HREB) in accordance guidelines provided in the HREA Act, the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2), the ICH-Good Clinical Practice Guidelines (ICH-GCP), and other guidelines or standards approved by the HREA.

Consent for publication Consent was obtained from all study participants.

Informed consent Informed consent was obtained from all individual participants included in the study.

Competing interests The authors declare that they have no conflict of interest.

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