

Consequences of the COVID-19 Pandemic for Health Profession Students: Perceptions about Academic Program Responsiveness and Mental Health Outcomes

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Abstract

Introduction: Given the likelihood of future disease outbreaks, there is a need to examine the mental health consequences of the COVID-19 pandemic for health profession students and the extent to which health profession program responses to the pandemic influenced student mental health.

Objectives: This study uses data from two cohorts (Cohort 1: N=257; Cohort 2: N=177) of health profession students during the COVID-19 pandemic (11/2020-3/2021 and 5/2021-1/2022) to examine and compare student mental health during these time frames and determine associations between students' perceptions of their programs' response to the pandemic and mental health outcomes.

Methods: Participants completed self-report measures assessing mental health outcomes (depression, anxiety, COVID-19 obsessive thoughts, sleep disturbance, academic stress) and perceptions of their program's response to the pandemic.

Results: Few between-cohort differences in mental health outcomes were found. In both cohorts, depression and anxiety symptoms, COVID-19 obsessive thoughts, and sleep disturbance were higher than those observed in the general population. Across both cohorts, the perception that their academic program had taken adequate steps to protect students' mental health was significantly negatively associated with all mental health outcomes.

Conclusion: Findings highlight the importance of visible and accessible mental health services that can mitigate the psychological burden of pandemics for health profession students.

Keywords: COVID-19, academic response, mental health, health profession students, pandemic impact

1. Introduction

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic (1). In the United States, as the number of new COVID-19 cases began to rapidly rise, the Centers for Disease Control and Prevention (CDC) recommended in March 2020 that places of learning discontinue in-person operations (2). By the end of the 2020 spring semester, more than 1300 colleges and universities across all 50 states had canceled classes or transitioned in-person classes to an online learning format. By fall 2020, many colleges and universities began bringing students back to the classroom, offering in-person instruction (with social distancing and mask requirements or recommendations) or a hybrid approach where both in-person instruction and online learning were used. With the widespread availability of COVID-19 vaccines in late 2020, more universities began transitioning back to full in-person learning in spring 2021.

Throughout the early stages of the pandemic, students needed to quickly adapt to new learning environments and modalities, in addition to other stressors associated with the pandemic, such as financial strain, uncertainty, illness, disability, and death. Not surprisingly, a large body of research has shown that undergraduate students exhibited a wide range of mental health problems during the early stages of the pandemic, including hopelessness, loneliness, sadness, depression, anxiety, worry, anger, sleep difficulties, and reduced overall well-being (3-5). Studies have also provided evidence that some university COVID-19 policies were associated with worse mental health outcomes. For example, Copeland et al (6) found that undergraduate students who were required to relocate reported more COVID-19-related grief, loneliness, and anxiety. Moreover, satisfaction with the university's response to COVID-19 was negatively associated with symptoms of anxiety and depression among undergraduate students (7). Finally, Salimi et al identified other consequences of the COVID-19 pandemic that may have influenced college student mental health, including reduced access to university mental health resources, reduced access to academic support, increased isolation from peers and established sources of support, and the need to adapt to new and frequently changing regulations and rules (8).

Although considerable research has been conducted on the mental health consequences of the COVID-19 pandemic for undergraduate students, less attention has been placed on examining consequences for students in the health professions (e.g., nursing, medicine, pharmacy, physician assistant). Similar to undergraduate students, health profession students may be considered a vulnerable population. Pre-pandemic research has consistently shown that students in the health professions are at elevated risk for a variety of psychiatric symptoms and maladaptive behaviors, including depression, anxiety, sleep difficulties, substance use problems, and suicidal thoughts and behaviors (9-16). Moreover, some studies have shown that the severity of mental health symptoms among health profession students is greater than that observed among other university students and individuals from the community (9).

With regard to the mental health consequences of COVID-19 for health profession students in particular, it is likely that the pandemic placed additional and unique stress on health profession students, relative to other students. In addition to having to navigate modifications to their academic programs consistent with those experienced by undergraduate students in other fields (e.g., transition to online learning), health profession students found themselves training to enter a field replete with novel risks to mental and physical health due to COVID-19. Indeed, the COVID-19 pandemic placed considerable strain on the healthcare system, resulting in high levels of burnout, anxiety, depression, and even posttraumatic stress symptoms among healthcare workers (17-18).

Studies examining the mental health consequences of the COVID-19 pandemic for health profession students have revealed a variety of mental health difficulties among these students during the pandemic. For example, Beisland et al (19) found that, compared to pre-pandemic functioning, nursing students across five universities reported lower general health, greater psychological distress, and lower quality of life. Likewise, in a review of 17 studies on the mental health functioning of nursing students (N = 13,247) during the pandemic, Mulyadi et al (19) found high rates of depression (52%), fear (41%), anxiety (32%), stress (30%), and sleep disturbance (27%). Elevated levels of posttraumatic stress disorder symptoms have also been found among nursing students during the pandemic (23.8-30%) (21-22). Medical students have also been found to exhibit

similar mental health problems during the COVID-19 pandemic, including depression, anxiety, stress, burnout, and sleep disturbance (23-27), as well as lower confidence in and satisfaction with their medical education (27).

Although characterizing the specific mental health difficulties experienced by health profession students during the COVID-19 pandemic offers the potential to identify promising targets for interventions for this population during future public health emergencies, research is also needed to identify malleable factors that contribute to the severity of these mental health difficulties, and thus may be targeted to optimize these interventions. Indeed, one limitation of previous studies examining mental health among health profession students during the COVID-19 pandemic is that they did not take into account or examine the influence of the academic programs' response to the pandemic. Given the high probability that disease outbreaks and other public health crises will occur, as well as the importance of advance preparation for such outbreaks and health crises (28), research examining the extent to which the program's response to a pandemic influences student mental health during the pandemic may inform the development of best practices for health profession programs and better prepare academic administrators, faculty, and students in effectively responding to future pandemics.

Therefore, the present study uses data collected from two cohorts of health profession students during two stages of the COVID-19 pandemic (November 2020 to March 2021 and May 2021 to January 2022) to address the following aims: (1) Determine levels of and associations among mental health outcomes (i.e., depression symptom severity, anxiety symptom severity, COVID-19 obsessive thoughts, academic program-related stress, and sleep disturbance) during the pandemic; (2) Explore differences between cohorts in mental health outcomes; and (3) Examine associations between students' perceptions of their academic programs' response to the COVID-19 pandemic and mental health outcomes. Given that data for the first cohort were collected earlier in the pandemic when vaccines were only starting to become available and many academic programs were still instituting a variety of restrictions and modifications to the learning environment, we expected that students in the first cohort would report significantly more severe mental health difficulties than students in the second cohort. Across both cohorts, we

expected that perceptions that their academic program was not taking sufficient steps to protect their mental and physical health would be associated with more severe mental health difficulties.

2. Methods

Participants

Cohort 1. Participants in Cohort 1 were 257 health profession students (77.4% female, 22.6% male) at a university and its affiliated medical center in the Midwest U.S. Participants ranged in age from 19 to 62 years (mean age = 24.89, $SD = 5.79$). With regard to their racial/ethnic background, 80.9% identified as White, 8.5% as Asian, 6.6% as Middle Eastern/Arabian, 6.2% as Latinx, 3.5% as Native American, and 0.4% as Black/African-American. The median annual household income for participants was \$20,000-\$29,999/year. The majority (60.3%) of participants indicated that they were receiving some form of financial aid for their education. As for program enrollment, 41.2% of participants were in medical school, 30.0% were in a nursing program, 18.3% were in a pharmacy doctoral program, and 10.5% were in a physician assistant program.

Cohort 2. Participants in Cohort 2 were 177 health profession students (77.4% female, 22.6% male) at a university and its affiliated medical center in the Midwest U.S. Participants ranged in age from 19 to 44 years (mean age = 24.08, $SD = 4.20$). With regard to their racial/ethnic background, 79.7% identified as White, 9.0% as Latinx, 9.8% as Asian, 6.2% as Middle Eastern/Arabian, and 4.0% as Native American. The median annual household income for participants was \$20,000-\$29,999/year, and the majority of participants (71.8%) indicated that they were receiving some form of financial aid for their education. As for program enrollment, 46.9% of participants were in a nursing program, 43.5% of participants were in medical school, and 9.6% were in a physician assistant program.

Measures

Participants completed a demographic form assessing sex, age, racial/ethnic background, past year household income, financial aid status, and the specific health profession program in which they were enrolled. Participants also completed several single-item questions pertaining to their experiences with and responses to the COVID-19 pandemic, including: (a) Do you know someone personally that has been infected with

COVID-19? (Yes or No); (b) Do you know someone personally that has died from COVID-19? (Yes or No); and (c) Have you been infected with COVID-19? (Yes or No).

To assess participants' perceptions of how their academic program responded to the COVID-19 pandemic, participants completed two questions: (a) Do you feel that your program has taken adequate measures to protect the physical health (e.g., reduce risk of COVID-19 infection) of you and other students in the program?; and (b) Do you feel that your program has taken adequate measures to protect the mental health of you and other students in the program?

Participants responded to each question using a 5-point Likert-type scale ranging from 1 (No, my program has done nothing to protect my physical/mental health during the COVID-19 pandemic) to 5 (Yes, my program has done a great deal to protect my physical/mental health during the COVID-19 pandemic).

The Depression Anxiety Stress Scales-21 (DASS-21) (29) was used to assess depression and anxiety symptom severity. The DASS-21 is a 21-item self-report measure used to differentiate between core symptoms of depression, anxiety, and stress. Participants are asked to rate items on a 4-point Likert-type scale (0 = "Did not apply to me at all;" 1 = "Applied to me to some degree, or some of the time;" 2 = "Applied to me to a considerable degree or a good part of time;" 3 = "Applied to me very much or most of the time"). The DASS-21 demonstrates adequate reliability and convergent and discriminant validity (29-30). Clinical cut-offs for the DASS-21 subscales have also been established, with scores >21 reflecting clinically severe levels of depression symptoms and scores >15 reflecting clinical severe levels of anxiety symptoms (30). Internal consistency of the depression and anxiety symptom severity subscales in the overall sample was acceptable ($\alpha = .90$ and $\alpha = .86$, respectively).

The Obsession with COVID-19 Scale (OCS) (31) is a 4-item self-report measure that assesses dysfunctional thought processes associated with the COVID-19 pandemic (e.g., "I could not stop thinking about the coronavirus."). Participants rate each item based on the extent to which they have experienced each item using a 4-point Likert-type scale ranging from 1 (not at all) to 4 (nearly every day over the last 2 weeks). In support of its construct validity, the OCS has been found to be significantly associated with coronavirus anxiety, hopelessness, suicidal ideation, and the use of alcohol and drugs to cope (31). Moreover, scores

of 7 or greater on the OCS have been found to reflect clinically-severe COVID-19 obsessive thoughts (31). The internal consistency of the OCS in the overall sample was acceptable ($\alpha = .84$).

The Work Related Quality of Life Scale (WRQoL) (32) is a 32-item self-report measure originally designed to assess healthcare workers' quality of working life. Participants rate their level of agreement with each item using a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The validity and reliability of the WRQoL has been examined primarily among healthcare workers and was modified for this study to describe quality of life within a healthcare profession academic program. The WRQoL assesses seven domains of quality of working life (e.g., stress at work, control at work, job and career satisfaction, etc.). As the present study was interested in evaluating the mental health consequences of the COVID-19 pandemic specifically, only the stress at work scale was examined (which was modified to assess stress within an academic program; e.g., I often feel under pressure at school). The WRQoL has been found to be a valid and reliable self-report measure (32-34). Internal consistency of the stress scale in the overall sample was acceptable ($\alpha = .80$).

The Pittsburgh Sleep Quality Index (PSQI) (35) assesses the patterns and quality of sleep in adults. The 19-item PSQI requires participants to rate their sleep across seven domains over the past month, including subjective sleep quality, sleep latency, sleep duration, sleep disturbance, habitual sleep efficiency, use of sleep medication, and daytime dysfunction. These domains are combined to create an overall index of sleep disturbance, with higher scores reflecting greater sleep disturbance. The PSQI demonstrates good internal reliability and construct validity (36), strong test-retest reliability (37), and adequate discriminant validity (35).

Procedure

All study procedures were approved by the university's Institutional Review Board (approved protocol 300826-UT). Data for Cohort 1 were collected between November 21, 2020 and March 18, 2021. Data for Cohort 2 were collected between May 17, 2021 and January 5, 2022, which coincided with the spread of the Delta COVID-19 variant throughout the United States. Cohort 2 was limited to a new group of students who did not participate in Cohort 1. To be eligible to participate in this study, participants were

Table 1. Descriptive data for and between cohort differences in mental health outcomes.

	Cohort 1 (N=257)		Cohort 2 (N=177)		<i>t</i>	<i>p</i>	<i>d</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
Attention to physical health	4.10	1.05	4.11	1.03	-0.15	.880	.01
Attention to mental health	3.02	1.29	3.04	1.21	-0.99	.324	.02
Depression symptom severity	4.54	4.82	3.79	4.20	1.69	.092	.17
Anxiety symptom severity	3.34	4.07	3.48	4.05	-0.34	.732	.03
COVID-19 obsessive thoughts	7.11	3.26	5.57	2.73	5.17	<.001	.51
Academic program-related stress	14.04	2.95	14.67	2.78	-2.19	.029	.22
Sleep disturbance	10.81	3.57	10.55	3.32	0.75	.451	.08

Note. Attention to physical health = Do you feel that your program has taken adequate measures to protect the physical health of you and other students in the program? (1 = No, my program has done nothing to protect my physical health during the COVID-19 pandemic; 5 = Yes, my program has done a great deal to protect my physical health during the COVID-19 pandemic). Attention to mental health = Do you feel that your program has taken adequate measures to protect the mental health of you and other students in the program? (1 = No, my program has done nothing to protect my mental health during the COVID-19 pandemic; 5 = Yes, my program has done a great deal to protect my mental health during the COVID-19 pandemic).

required to be 18 years of age and enrolled in a nursing program, medical school, physician assistant program, or pharmacy doctoral program. Eligible students were invited to participate in the study through a mass email sent by program directors and departmental administrators. The email provided a description of the study and included a link to an online survey, including the questionnaires previously described. Following completion of the study, participants were provided with financial reimbursement in the form of an electronic gift card.

Analysis Plan

Descriptive statistics and Pearson product-moment correlations were conducted to examine levels of and associations among primary variables of interest within each cohort separately. A series of chi-square analyses were conducted to examine between cohort differences in participants' experiences with and responses to the COVID-19 pandemic. A series of independent t-tests were then conducted to examine between cohort differences in depression symptom severity, anxiety symptom severity, COVID-19 obsessive thoughts, academic program-related stress, and sleep disturbance. Finally, a hierarchical linear regression analysis was conducted to examine associations between participants' perceptions of their health profession programs'

response to the COVID-19 pandemic and outcomes (depression symptom severity, anxiety symptom severity, COVID-19 obsessive thoughts, academic program-related stress, and sleep disturbance), controlling for relevant variables (i.e., age, sex, racial/ethnic background, income, and cohort membership).

3. Results

Cohort 1

Descriptive statistics for and correlations among the primary variables of interest for Cohort 1 are presented in Tables 1 and 2, respectively. Only 9.6% of participants in Cohort 1 had knowingly been infected with COVID-19; however, most participants (96.1%) had known someone who was infected with COVID-19 and 25.2% of participants had known someone who died as a result of COVID-19. Only 11.7% of participants had received the COVID-19 vaccine (of note, the COVID-19 vaccine became available during data collection for Cohort 1, with most data being collected prior to the vaccine being available). Within Cohort 1, 14% of participants reported severe or higher levels of depressive symptoms, and 14.8% reported severe or higher anxiety symptoms.

Table 2. Correlations among primary variables of interest in Cohort 1 and Cohort 2.

	1.	2.	3.	4.	5.	6.	7.
1. Attention to physical health	---	.46 <.001	-.21 .001	-.13 .038	-.08 .208	-.27 <.001	-.12 .047
2. Attention to mental health	.49 <.001	---	-.26 <.001	-.25 <.001	-.18 .004	-.41 <.001	-.32 <.001
3. Depression symptom severity	.05 .530	-.28 <.001	---	.62 <.001	.22 <.001	.42 <.001	.39 <.001
4. Anxiety symptom severity	-.07 .337	-.19 .010	.56 <.001	---	.32 <.001	.40 <.001	.39 <.001
5. COVID-19 obsessive thoughts	-.06 .418	-.16 .038	.36 <.001	.48 <.001	---	.26 <.001	.29 <.001
6. Academic program-related stress	-.08 .295	-.27 <.001	.37 <.001	.26 <.001	.25 <.001	---	.40 <.001
7. Sleep disturbance	.08 .284	-.23 <.001	.50 <.001	.37 <.001	.36 <.001	.102 .183	---

Note. *p* values are located below correlation coefficient. Correlations for Cohort 1 are located in the top right portion of the table. Correlations for Cohort 2 are located in the bottom left portion of the table. Attention to physical health = Do you feel that your program has taken adequate measures to protect the physical health of you and other students in the program? (1 = No, my program has done nothing to protect my physical health during the COVID-19 pandemic; 5 = Yes, my program has done a great deal to protect my physical health during the COVID-19 pandemic). Attention to mental health = Do you feel that your program has taken adequate measures to protect the mental health of you and other students in the program? (1 = No, my program has done nothing to protect my mental health during the COVID-19 pandemic; 5 = Yes, my program has done a great deal to protect my mental health during the COVID-19 pandemic).

In addition, 47.5% of participants reported clinically-severe levels of COVID-19 obsessive thoughts. The perception that one's academic program was taking adequate steps to protect students' physical health was negatively significantly associated with depression symptom severity, anxiety symptom severity, academic program-related stress, and sleep disturbance (see Table 2). Likewise, the perception that one's academic program was taking adequate steps to protect students' mental health was negatively significantly associated with depression symptom severity, anxiety symptom severity, COVID-19 obsessive thoughts, academic program-related stress, and sleep disturbance (see Table 2).

Cohort 2

Descriptive statistics for and correlations among the primary variables of interest for Cohort 2 are presented in Tables 1 and 2, respectively. Within Cohort 2, 28.3% of participants had knowingly been infected with COVID-19. Most participants (93.8%) had known someone who was infected with COVID-19 and over one-third of participants (34.1%) had known someone who died as a result of COVID-19. Most participants in

Cohort 2 (89.3%) had received the COVID-19 vaccine. Within Cohort 2, 9% of participants reported severe or higher levels of depressive symptoms, and 16.9% of participants reported severe or higher anxiety symptoms. Moreover, 21% of participants reported clinically-severe levels of COVID-19 obsessive thoughts. Unlike Cohort 1, the perception that one's academic program was taking adequate steps to protect students' physical health was not significantly associated with any mental health outcome (see Table 2). However, similar to Cohort 1, the perception that one's academic program was taking adequate steps to protect students' mental health was negatively significantly associated with all outcomes (see Table 2).

Between Cohort Differences

A significantly greater percentage of participants in Cohort 2 versus Cohort 1 had received the COVID-19 vaccine, $\chi^2 = 257.01$, $p < .001$, knew someone who had died as a result of COVID-19, $\chi^2 = 3.92$, $p = .048$, and had been infected with COVID-19, $\chi^2 = 22.77$, $p < .001$. There were no significant between cohort differences in the proportion of participants who reported

knowing someone who had been infected with COVID-19, $\chi^2 = 0.12$, $p = .732$. Cohort 1 participants reported significantly more severe COVID-19 obsessive thoughts and academic program-related stress than Cohort 2 participants (see Table 1). No significant between cohort differences were found for depression symptom severity, anxiety symptom severity, sleep disturbance, or the perception that their program had taken adequate measures to protect students' mental and physical health (see Table 1).

Effect of Program Response to COVID-19 Across Both Cohorts

Across all analyses, perceptions that one's academic program had taken adequate measures to protect students' mental and physical health (together) accounted for a significant amount of additional variance in all mental health outcomes above and beyond covariates (sex, age, racial/ethnic background, income, cohort). However, it was perceptions pertaining to the protection of students' mental health that appeared to drive this finding. Specifically, such perceptions were significantly negatively associated with depression symptom severity, anxiety symptom severity, COVID-19 obsessive thoughts, academic program-related stress, and sleep disturbance (see Table 3). In other words, the perception that one's academic program did not take adequate measures to protect students' mental health during the COVID-19 pandemic was associated with more severe mental health difficulties.

4. Discussion

This study used data collected from two cohorts of students in different health profession programs (medicine, nursing, physician assistant, and pharmacy) during two stages of the COVID-19 pandemic (November 2020 to March 2021 and May 2021 to January 2022) to examine a variety of mental health difficulties among health profession students during the pandemic, as well as explore the influence of students' perceptions of the measures taken by their academic programs to protect student mental and physical health during the pandemic on mental health outcomes. Hypotheses were partially supported. Although we hypothesized that Cohort 1 would report significantly greater mental health difficulties than Cohort 2, few differences in mental health outcomes were observed between cohorts. The only significant differences were for COVID-19

obsessive thoughts and academic program-related stress, with Cohort 1 students reporting significantly greater levels than students in Cohort 2. Such findings are not surprising given when data were collected. Data from Cohort 1 students were collected earlier in the pandemic when COVID-19 vaccines were not widely available (11.7% of Cohort 1 students had received the vaccine compared to 89.3% of students in Cohort 2) and more restrictions were present in the learning environment (e.g., a high reliance on online learning and limited access to academic settings and resources).

The lack of significant differences on other mental health outcomes may be a consequence of health profession students being at increased risk for mental health problems in general (regardless of the context in which data are collected). Indeed, findings provide support for health profession students being considered a vulnerable population. The percentage of participants reporting at least severe levels of depression (14% in Cohort 1 and 9% in Cohort 2) and anxiety (14.8% in Cohort 1 and 16.9% in Cohort 2) symptoms was considerably higher than found in the general population prior to the pandemic using the same measure (2.9% for depression and 2% for anxiety) (38). Likewise, rates of clinical levels of COVID-19 obsessive thoughts in both cohorts (47.5% in Cohort 1 and 21% in Cohort 2) were greater than those reported in general population studies (5.5%)³⁹ and 10.5%) (40). Students in both cohorts also exhibited average sleep disturbance scores that were well above recommended cut-offs on the PSQI (>5) (37) and consistent with mean scores obtained within clinical samples of patients with insomnia (12.7 ± 3.8) (36); 10.2 ± 3.2) (41).

Finally, across both cohorts, the perception that their academic program had taken adequate steps to protect students' mental health was significantly negatively associated with all examined mental health outcomes, including depression and anxiety symptom severity, COVID-19 obsessive thoughts, sleep disturbance, and academic program-related stress. These findings were robust, remaining significant even when accounting for the variance associated with relevant demographic characteristics (including those previously found to be associated with worse mental health outcomes among students, such as gender and racial/ethnic minoritized group status) (27, 42-43) and perceptions regarding academic programs' attempts to protect students' physical health. These findings suggest that

programmatic efforts aimed at protecting student mental health were more relevant to a variety of mental health outcomes than those aimed at protecting the physical health of students (although zero-order correlations demonstrated significant negative associations between perceptions that one's academic program had taken adequate steps to protect students' physical health and depression symptom severity, anxiety symptom severity, sleep disturbance, and academic program-related stress in Cohort 1, albeit not in Cohort 2). Together, these findings suggest that programmatic (and recognized) attempts aimed at protecting students' physical health may have been more relevant to mental health outcomes in the earlier stages of the COVID-19 pandemic when other protective measures for reducing susceptibility to COVID-19 infection (e.g., vaccines) were not widely available. Conversely, programmatic efforts aimed at protecting students' mental health in the context of COVID-19 may be relevant to student's mental health outcomes throughout the pandemic.

Results must be considered in light of the limitations present. First, data were cross-sectional and correlational in nature. As a result, we can only speak to associations among variables and can draw no conclusions regarding causality or the temporal order of the examined relations. For example, although the perception that academic programs are not taking adequate steps to protect the mental health of their students may increase students' anxiety, worry, frustration, and perceived control (influencing a variety of mental health outcomes), it is equally plausible that high levels of anxiety and depression symptoms may contribute to negative information processing biases (44) that influence perceptions of academic program policies. Longitudinal studies would provide more insight into the precise nature of the relations among the variables examined in this study.

Second, pre-pandemic data on students' mental health difficulties and perceptions of their academic programs were not available. Therefore, our findings cannot speak to whether the mental health difficulties reported by participants indicate an elevation in symptoms as a result of the pandemic or simply that health profession students are a vulnerable population in general. Regardless, findings do bring attention to the fact that a significant proportion of health profession students are experiencing mental health difficulties in the context of a pandemic, a global health crisis that presents additional stressors that

could exacerbate pre-existing mental health difficulties and negatively affect overall mental and physical health functioning and quality of life. Finally, all students were recruited from a single institution in the Midwestern U.S. Given this, findings may not generalize to other institutions in the U.S. or internationally.

Considering the variations in institutional and program-related policies pertaining to the COVID-19 pandemic, there is likely great variation in students' perceptions of how effectively their institutions and programs protected their mental and physical health during the pandemic. Consequently, examination and replication of these relations in other health profession programs is needed.

Despite limitations, findings from the present study add to the current literature that shows high rates of mental health difficulties among health profession students in general (10-13) and during different stages of the COVID-19 pandemic in particular (19-20, 26-27). Given the strong likelihood of future disease outbreaks and pandemics, and their likely impact on academic programs and health related professions in general, it is important to learn from experiences of students during the COVID-19 pandemic. Our findings highlight the importance of visible and accessible mental health services aimed at mitigating the psychological burden of pandemics for students in health profession programs. In particular, findings that it was students' perceptions of their programs' policies and protection efforts that were significantly related to mental health outcomes (vs. the program's actual protective efforts or policies) highlight the importance of ensuring that institutional and program-related efforts aimed at promoting mental health in students are transparent, visible, and student-centered. Moreover, regular assessment of students' mental health needs may identify ways to broaden or improve upon available services and resources, as well as potential barriers students may face (e.g., stigma, time constraints, finances) when attempting to access these resources. Health profession programs may benefit from an idiographic and flexible approach to meeting the myriad mental health needs of students. Providing health profession students with a variety of different options for obtaining mental health support (e.g., in-person, remote/online, and peer support resources) may increase the accessibility of these services and specifically address identified barriers to obtaining needed mental health care.

Table 3. Associations between students' perceptions that their academic program had taken adequate steps to address students' mental and physical health during the COVID-19 pandemic and mental health outcomes.

	<u>Depression</u>		<u>Anxiety</u>		<u>COVID Obsessions</u>		<u>Academic Stress</u>		<u>Sleep Disturbance</u>	
	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>
Step 1	$R^2=.03, \Delta R^2=.03, F=2.41, p=.036$		$R^2=.05, \Delta R^2=.05, F=4.25, p<.001$		$R^2=.09, \Delta R^2=.09, F=8.50, p<.001$		$R^2=.05, \Delta R^2=.05, F=4.18, p=.001$		$R^2=.07, \Delta R^2=.07, F=6.09, p<.001$	
Sex	2.41(1.04)	.021	3.17(.92)	.001	1.21(.35)	.001	.41(.33)	.220	2.04(.39)	<.001
Age	-.13(.08)	.120	-.20(.074)	.009	.04(.03)	.130	-.10(.03)	<.001	.02(.03)	.499
Race/Ethnic background	-.24(1.10)	.830	.96(.97)	.321	-.21(.37)	.577	.17(.35)	.618	.56(.41)	.173
Income	-1.04(.88)	.238	-.86(.78)	.270	.16(.29)	.587	-.18(.28)	.530	-.11(.33)	.750
Cohort	-1.48(.89)	.096	.20(.78)	.794	-1.51(.30)	<.001	.56(.28)	.046	-.20(.33)	.548
Step 2	$R^2=.09, \Delta R^2=.07, F=6.18, p<.001$		$R^2=.09, \Delta R^2=.04, F=5.80, p<.001$		$R^2=.12, \Delta R^2=.03, F=8.19, p<.001$		$R^2=.16, \Delta R^2=.11, F=11.25, p<.001$		$R^2=.15, \Delta R^2=.08, F=10.49, p<.001$	
Attention to physical	.19(.46)	.686	-.06(.41)	.895	-.03(.16)	.856	-.09(.14)	.531	.29(.17)	.092
Attention to mental	-1.93(.38)	<.001	-1.28(.34)	<.001	-.41(.13)	.002	-.73(.12)	<.001	-.87(.14)	<.001

Note. Sex = Sex at birth coded as 0 (Male) and 1 (Female). Race/Ethnic background coded as 0 (Minoritized) and 1 (White). Income coded as 0 ($\leq \$29,999$ /year) and 1 ($\geq \$30,000$ /year). Cohort coded as 1 (Cohort 1) and 2 (Cohort 2) Attention to physical = Do you feel that your program has taken adequate measures to protect the physical health of you and other students in the program? Attention to mental = Do you feel that your program has taken adequate measures to protect the mental health of you and other students in the program?

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