

Psychological Trauma: Theory, Research, Practice, and Policy

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Patterns and Correlates of Traumatic Stress, Depression, Anxiety, and Moral Injury in U.S. Health Care Providers Late in the COVID-19 Pandemic

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Objective: Providing health care during the COVID-19 pandemic has been associated with a high mental health burden for health care providers. This study examined patterns of responses and correlates of class membership across commonly assessed mental health symptoms, psychosocial functioning, and moral injury for providers in the United States in Fall 2022. **Method:** A convenience sample of 1,504 primary care physicians, pediatricians, nurse practitioners, and physician assistants who had been in practice for three or more years ($M_{\text{age}} = 46.1$ years, $SD_{\text{age}} = 11.3$, 58% male) completed self-report measures in an online, opt-in panel survey from September to November 2022. **Results:** Using latent class analysis, three classes were identified: No/Low Symptoms (64.8%), High Moral Injury (19.9%), and Elevated Symptoms (15.2%). Several factors were correlated with class membership including age, sex, social support, personal risk of COVID-19, pandemic-related work stressors, proportion of COVID-19 patients seen at the height of the pandemic, and death of a patient due to COVID-19. **Conclusions:** This study found high levels of mental health symptoms, and problems with psychosocial functioning and moral injury in health care providers well past the pandemic's peak. The results also demonstrated the importance of considering the unique contribution of moral injury to psychosocial functional difficulties experienced by health care providers during the pandemic given their defined role as essential workers. These findings have implications for preventing and managing mental health problems and burnout among providers postpandemic as well as for future pandemics at both the organizational and individual levels.

Clinical Impact Statement

This study examined patterns in reported symptoms of depression, anxiety, posttraumatic stress, moral injury (feeling morally responsible for causing or failing to prevent harm to others), and psychosocial functioning in health care providers 2 years into the pandemic. We found three patterns, no/low symptoms (65%), high moral injury and psychosocial functional problems with moderate posttraumatic stress (19.9%), and moderate to high symptoms across all outcomes (15.2%), suggesting that many providers are still struggling with mental health problems. This study also highlighted moral injury's role in postpandemic psychological adjustment and identified several factors associated with classification into the symptomatic groups.

Keywords: latent class analysis, mental health, moral injury, health care providers, COVID-19 pandemic

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Providing care during the COVID-19 pandemic has had a substantial impact on the mental health of health care providers in the United States. Several reviews indicate a considerable rise in mental health morbidity including depression, anxiety, posttraumatic stress, suicidal ideation, and impairment in psychosocial functioning in health care providers around the world (e.g., Chutiyami et al., 2022; Lixia et al., 2022) and in the United States (e.g., Amsalem et al., 2021; Prasad et al., 2021). While much of the data are from early in the pandemic, data from previous pandemics suggest that the deleterious effects of providing health care during a pandemic are likely to persist for many providers postpandemic (Hill et al., 2022). Factors found to affect the intensity of psychological problems in response to the COVID-19 pandemic include age, gender, provider type, occupational stress, fear of illness, number of COVID-19 patients treated, exposure to death, social support, sleep problems, and demoralization (De Brier et al., 2020; Dragioti et al., 2022; Hendrickson et al., 2022; Lixia et al., 2022). Related to demoralization, the phenomenon of moral injury in health care providers has received attention in the last several years, driven in part by the COVID-19 pandemic. Moral injury is defined as a response to the commission, omission, witnessing, or failure to prevent violations of one's personal or one's group's code of conduct or moral standards that affect one's health and psychosocial functioning (Litz et al., 2009; Yeterian et al., 2019). The concept of moral injury was originally developed to describe the experiences of culpability from friendly fire and civilian harm in combat veterans but has been recently identified as a factor affecting adjustment for personnel in settings involving life-or-death decision-making or having a high potential for harm to others, including health care (e.g., Ehman et al., 2023). The COVID-19 pandemic has created uniquely challenging circumstances for health care providers, many of whom encountered overwhelming patient needs exacerbated by shortages of necessary equipment and staffing, while also trying to protect themselves and their families from infection (e.g., Hagerty & Williams, 2022). Indeed, a burgeoning literature focusing on health care professionals in the United States has found high levels of moral injury (e.g., Ehman et al., 2023; Weber et al., 2023) as a result of exposure to potentially morally injurious events (PMIEs) during health care provision and high levels of anxiety, depression, posttraumatic stress, impairment in psychosocial functioning, and suicidality (e.g., Amsalem et al., 2021; Ehman et al., 2023; Hagerty & Williams, 2022)—a result seen in other professions having a high potential for harm to others (e.g., McEwen et al., 2021).

In the nascent literature on health care providers, only two studies have examined patterns of responding resulting from care provision during the COVID-19 pandemic in health care workers. Both studies used latent class analysis to examine patterns of responses indexed by responses to the Moral Injury Events Scale (Nash et al., 2013) adapted by Khan et al. (2021) for civilians. The first examined the responses of health care providers (72%) and nonclinical health care professionals (28%) and found four classes in Moral Injury Events Scale responses: minimal moral injury, high moral injury due to actions perpetrated by self, high moral injury due to actions perpetrated by others, or high moral injury due to societal betrayal (Weber et al., 2023). All three high moral injury classes were found to report significantly more impairment in social and occupational functioning compared to the minimal exposure class. Similarly, Zerach and Levi-Belz (2021) found three classes in medical (83.1%) and behavioral (16.9%) health care providers in Israel during the pandemic: minimal moral

injury, high moral injury (including self- and other-perpetrated events), and betrayal-only moral injury. Nurses reporting high job stress and younger ages had an increased probability of inclusion in the high moral injury class. As with Weber et al. (2023), the high moral injury classes were associated with increases in depression, posttraumatic stress, and relationship problems.

Overall, both above studies found that increases in moral injury were associated with increased problems across multiple indicators of mental health including psychosocial functioning. However, these studies did not examine if there were specific patterns of response in the mental health indicators themselves when accounting for moral injury. Thus, the goals of the present study were as follows: (a) to examine if a sample of U.S. health care providers, 2 years into the COVID-19 pandemic and after PMIE exposure, demonstrates symptom profiles across commonly assessed indicators of psychological adjustment and an index of psychosocial functioning (when considering levels of moral injury), and (b) to identify factors that increase the probability of inclusion in any of the identified symptom profiles. The present study differed in methodology from the two previous studies by examining patterns of responses across full-scale scores of all the indicators of adjustment, instead of item-level analysis of moral injury scale items. This allowed the examination of patterns of response that would be most analogous to what might be examined in a clinical setting across commonly evaluated categories of mental health difficulties. The benefit of identifying common patterns of responses across individuals in health care settings, as well as identifying factors associated with group membership, allows for the development of tailored interventions to address health care providers' unique mental health needs. This work can also inform the development of policies and interventions to reduce the mental health impacts of future public health emergencies among this population of essential workers.

Method

Participants and Procedure

Data were collected as part of DocStyles, an internet-based survey administered to primary care physicians and other specialties commissioned by Porter Novelli Public Services for the U.S. Centers for Disease Control and Prevention. Porter Novelli Public Services and its vendors are not subject to review by Centers for Disease Control and Prevention's Institutional Review Board; they adhere to professional standards and codes of conduct set forth by the Insights Association (<https://www.insightsassociation.org/Resources/Code-of-Standards>). DocStyles survey participants were selected using a quota-based convenience sample of U.S. health care providers actively practicing in the United States for at least 3 years who were recruited from the global market research company SERMO's Global Medical panel (SERMO, 2021).¹ The Fall 2022 DocStyles survey contained 109 questions on a range of topics including socio-demographics, exposure to COVID-19 at work, and the effects of the COVID-19 pandemic on current mental health. The survey was offered to 2,669 health care providers and had a 65.8% response rate. Excluded from the current analysis are obstetricians and gynecologists ($N = 251$) who did not receive the mental health section of

¹ A priori quotas for this study were 1,000 primary care physicians, 250 obstetricians/gynecologists, 250 pediatricians, and 250 nurse practitioners/physician assistants.

the survey. The final sample ($N = 1,504$) included 1,002 primary care physicians, 251 pediatricians, 123 nurse practitioners, and 128 physician assistants. The Fall DocStyles survey was administered from September 9, 2022, to November 3, 2022. Respondents received a \$50–\$65 honorarium for completing the survey based on the number of questions completed.

Measures

Demographics

In addition to information regarding health care provider's age, sex, and racial and ethnic identity, the survey ascertained work-related information such as provider type (primary care physician, pediatrician, nurse practitioner, or physician assistant), work setting (individual outpatient practice, group outpatient practice or clinic, or inpatient practice/hospital), and community setting (urban, suburban, or rural). The proportion of patients seen each week by the health care provider for COVID-19-related problems during the most intense period of the pandemic was also collected.

Depression and Anxiety

Depression was assessed using the two-item anxiety Patient Health Question scale (Kroenke et al., 2003; $\alpha = .82$ in this study), consisting of (a) feeling down, depressed, or hopeless and (b) little interest or pleasure in doing things. Anxiety was assessed using the two-item anxiety Generalized Anxiety Disorder scale (Kroenke et al., 2007; $\alpha = .83$) that assessed (a) feeling nervous, anxious, or on edge and (b) not being able to stop or control worrying. Both measures are considered to be reliable short screening instruments for depressive and anxiety disorders, comparing favorably with the full Patient Health Questionnaire-9 and Generalized Anxiety Disorder-7 scales (e.g., Staples et al., 2019). For each scale, items were rated from *not at all* = 0 to *nearly every day* = 3 resulting in total scores ranging from 0 to 6, with a cutoff of ≥ 3 being indicative of clinically relevant problems with depression or anxiety.

Posttraumatic Stress

Symptoms of posttraumatic stress disorder (PTSD) were measured using the five-item Primary Care PTSD Screen for DSM-5 (Prins et al., 2016) assessing five core experiences of PTSD. For this study, the instructions were modified to index reactions to the COVID-19 pandemic ("Have you ever had any of the following experiences as a result of being a health care provider during the COVID-19 pandemic?") and endorsed as "Yes" = 1 or "No" = 0, if experienced in the past 30 days. Total scores ranged from 0 to 5. A cut-score of 4 was used as a marker for probable PTSD diagnosis (see Bovin et al., 2021). Cronbach's α was .83.

Moral Injury

Three items from the 11-item Moral Injury Symptom Scale–Healthcare Professionals Version (Mantri et al., 2020) were used to assess moral injury. The Moral Injury Symptom Scale–Healthcare Professionals Version screens for symptoms of moral injury associated with problems with psychosocial functioning with three identified factors: guilt/shame, spiritual troubles, and condemnation. Three items with the highest factor loadings for the guilt/shame scale were retained

("I feel guilt over failing to save someone from being seriously ill or dying," "I feel ashamed about what I've done/not done when providing care to my patients," and "I feel troubled by having acted in ways that violated my own morals or values"). In addition, an item was added to assess an aspect of moral injury that might be unique to being a health worker during the pandemic, "I feel troubled by not having been able to perform my job to the best of my abilities." Items were rated on a scale of *strongly disagree* = 1 to *strongly agree* = 5, in response to "When thinking about working as a health care provider during the COVID-19 pandemic, how much do you agree or disagree with the following statements?" Cronbach's α was .83, suggesting good reliability.

Psychosocial Functioning Difficulties

Problems with psychosocial functioning were assessed using two items from the "Role limitations due to emotional problems" subscale of the RAND-36, a widely used measure of health-related quality of life measure (Ware & Sherbourne, 1992). These items were (a) "Accomplished less than you would like" and (b) "Didn't do work or other activities as carefully as usual." An additional item that indexed problems often associated with posttraumatic stress was added, "Interfered with social relationships/activities or getting along with others." Items were scored as "Yes" = 1 or "No" = 0, with total scores ranging from 0 to 3. Cronbach's α was .76, suggesting adequate reliability.

Pandemic-Related Work Stressors

Items assessing pandemic-related work stressors were developed for this study based on existing literature (International Council of Nurses, 2020) about health care provider occupational stressors during the COVID-19 pandemic. The resultant scale ($\alpha = .91$) consisted of a list of 14 stressors indexing lack of adequate (a) staffing, (b) beds for COVID-19 patients, (c) equipment (e.g., ventilators), (d) supplies, (e) personal protective equipment, (f) clear guidance/treatment protocols, (g) COVID-19 tests, (h) manager concern for well-being, (i) capacity to give self-care, and increases in (j) shifts/work hours, (k) workload/job demands, (l) need for constant awareness/vigilance, (m) COVID-19 denial/misinformation, and (n) feelings of burnout as "Yes" = 1 or "No" = 0, with total scores ranging from 0 to 14.

Social and Emotional Support

Perceived social and emotional support was assessed based on a question from the 2017 Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System survey (https://www.cdc.gov/brfss/annual_data/annual_2017.html), modified into three questions to assess perceived support from (a) family and friends, (b) coworkers, and (c) work supervisors (e.g., "How often do you get the social and emotional support from co-workers/family and friends/work supervisor(s) you need?"). For the question regarding the supervisor, a "Not applicable" option was included. Respondents ($N = 168$) selecting this option were excluded from the analysis involving this question using listwise deletion. The scores of each scale ranged from 1 (*never*) to 5 (*always*).

Personal Risk of COVID-19

Three items indexing stress related to health workers' perception of their risk of being infected with COVID-19 were created for this study ($\alpha = .78$) and asked, "During the past month, how often have ... (1) you worried about your own chances of getting COVID-19, (2) your thoughts about your chances of getting COVID-19 affected your mood, and (3) your thoughts about your chances of getting COVID-19 affected your ability to perform your job or your daily activities." Items were rated on a scale of *not at all* = 1 to *almost all the time* = 5 with average scores used in the analyses.

Data Analysis

To detect common response patterns across multiple indicators of mental health, we used latent class analysis (LCA) using the *poLCA* package Version 1.6.0.1 (Linzer & Lewis, 2011) of R Statistical Software Version 4.2.2 (R Core Team, 2022) to identify underlying or latent patterns (or classes) in the variation in the individuals reported levels of anxiety, depression, posttraumatic stress, moral injury, and difficulties in psychosocial functioning (see Weller et al., 2020). LCA not only helps with the identification of common response patterns across individuals but also allows assessment of predictors that might increase the probability of membership in any identified class using latent class regression.

For the LCA, full-scale scores were utilized to make the analysis conform more closely to clinical practice. The published clinical cutoffs for the Generalized Anxiety Disorder-2, Patient Health Questionnaire-2, and Primary Care PTSD scales assessing anxiety, depression, and posttraumatic stress, respectively, were used to dichotomize these scales (Bovin et al., 2021; Staples et al., 2019). Given there are no established clinical cutoffs for the moral injury scale, a mean split was used. Finally, to make this more clinically meaningful and to see if specific symptom profiles were associated with different levels of functioning, difficulties with psychosocial functioning ratings were included in the analysis. The psychosocial difficulties scale was dichotomized as those endorsing work or social functioning difficulties versus not. Six models were evaluated to determine the best-fitting model by examining relevant fit indices, parsimony, class sample size, and interpretability.

Results

Among the 1,504 providers who completed the study, the mean age of participants was 46.11 ($SD = 11.30$) and mean years in practice was 15.85 ($SD = 9.46$). Approximately 58% identified as male, 41% as female, and 1% as other (Table 1). For race/ethnicity, 6.4% of the sample identified as Hispanic, 74.0% of whom identified as White, 9.4% as Multiracial, 4.2% as Black, 4.2% as Asian, 2.1% as American Indian or Alaska Native, and 6.3% as Other Race. Of the 93.6% of people who identified as non-Hispanic, 64.1% identified as White, 24.4% as Asian, 4.0% as Black, 0.4% as Native Hawaiian or other Pacific Islander, 0.4% as American Indian or Alaska Native, 3.4% as Multiracial, and 3.9% as Other Race. Practitioners' main work setting was group outpatient practice or clinic (65.4%), inpatient practice/hospital (20.1%), and individual outpatient practice (14.6%). Overall, 51.6% of participants worked primarily in suburban areas, 38.4% in urban areas, and 10.0% in rural areas. The reported proportion of patients seen each week for COVID-19-related problems during the

most intense period of the pandemic was none (3.2%), less than 20% (34.9%), 21%–40% (23.3%), 41%–60% (17.1%), 61%–80% (12.4%), and 81%–100% (9.1%).

Latent Class Analysis

Table 2 provides the goodness-of-fit indices for the six LCA models assessed with one to six classes. Examination of the model fit indices, which allow assessment of model inclusiveness, promoting accuracy, and parsimony, converged to indicate that the three-class model yielded the best overall fit with the lowest Bayesian information criterion and consistent Akaike information criterion scores, entropy (separation between classes) of .80, and class sizes of more than 5% of the sample (Weller et al., 2020). The three-class solution also demonstrated good parsimony, and the resultant classes lent themselves to clear interpretation. Figure 1 shows the contribution of each scale in predicting probable class membership for the three-class solution. Post hoc examination of the differences in percentages of those meeting cutoffs for anxiety, depression, and PTSD symptoms was completed using two proportion z tests. Results indicated that Classes 1 and 2 did not differ in the proportion of those who met clinical cutoffs for anxiety, but both differed significantly from Class 3, which had significantly more members exceeding the cutoff (Table 1). For depression, all three classes significantly differed from each other in the proportion of members who exceeded the clinical cutoff, with Class 3 having a higher proportion than Class 2, which was higher than Class 1. Finally, for PTSD, Classes 2 and 3 did not significantly differ in those exceeding the clinical cutoff for PTSD but both had a higher proportion than Class 1.

Supplementing these findings, differences in the continuous measure of adjustment between classes using analysis of variance and post hoc Scheffé tests indicated that anxiety and depression symptom levels and psychosocial functional difficulties significantly increased when moving from Class 1 to Class 2 to Class 3 (Table 1). However, only the average class score for Class 3 for anxiety exceeded clinical cutoffs. Similar to the two proportion z tests reported above, average PTSD symptom levels were not statistically different between Classes 2 and 3, but both were statistically higher than Class 1. However, none of the average PTSD scores for any group exceeded the clinical cutoff for PTSD. Average group moral injury scores significantly increased when moving from Class 1 to Class 3 to Class 2.

Taken as a whole, the first of the resultant three classes (Figure 1) consisted of a No/Low Symptom group (Class 1; 64.8%) characterized by low to no probability of exceeding clinical cutoffs for any symptom measures or having difficulties with psychosocial functioning or moral injury. The second class constituted a High Moral Injury group (Class 2; 19.9%) characterized by a high probability of moral injury and psychosocial functional difficulties with low to moderate probability of posttraumatic stress, anxiety, and depressive symptoms. The third class was an Elevated Symptoms group (Class 3; 15.2%) characterized by a high probability of anxiety symptoms and psychosocial functional difficulties associated with moderate but significant increases in all other outcome measures.

Correlates of Probable Class Membership

To examine factors that affect the probability of class membership, latent class regression models were used to test if specific covariates increased the probability of membership in any class (Linzer &

Table 1

Descriptives With Frequencies (With Percentages) of Categorical Variables and Mean Scores (With Standard Deviations) of Continuous Variables

Categorical variable	Total sample (<i>N</i> = 1,504)	Class 1: no/low symptom (<i>N</i> = 975)	Class 2: high moral injury (<i>N</i> = 300)	Class 3: elevated symptoms (<i>N</i> = 229)
	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)
Gender				
Male	873 (58%)	594 _a (61%)	158 _b (53%)	121 _b (53%)
Female	614 (41%)	369 _a (38%)	138 _b (46%)	107 _b (47%)
Other	17.00 (1%)	12 _a (1%)	4 _a (1%)	1 _a (0%)
Provider specialty				
Primary care physician	1,002 (67%)	649 _a (67%)	201 _a (67%)	152 _a (66%)
Pediatrician	251 (17%)	171 _a (18%)	48 _a (16%)	32 _a (14%)
Nurse practitioner	123 (8%)	74 _a (8%)	25 _a (8%)	24 _a (10%)
Physician assistant	128 (9%)	81 _a (8%)	26 _a (9%)	21 _a (9%)
Community type				
Urban	578 (38%)	357 _a (37%)	87 _{a,b} (38%)	134 _b (45%)
Suburban	776 (52%)	524 _a (54%)	116 _{a,b} (51%)	136 _b (45%)
Rural	150 (10.0%)	94 _a (10%)	26 _a (11%)	30 _a (10%)
Work setting				
Individual outpatient practice	219 (15%)	154 _a (16%)	29 _a (13%)	36 _a (12%)
Group outpatient practice or clinic	983 (65%)	643 _a (66%)	151 _a (66%)	189 _a (63%)
Inpatient practice/hospital	302 (20%)	178 _a (18%)	49 _{a, b} (21%)	75 _b (25%)
COVID-19 patient death				
No	1,269 (84%)	852 (87%)	227 (76%)	190 (83%)
Yes	235 (16%)	123 _a (13%)	73 _b (24%)	39 _{a,b} (17%)
Anxiety cutoff				
Below cutoff	1,264 (84%)	964 (99%)	300 (100%)	0 (0%)
Meet cutoff	240 (16%)	11 _a (1%)	0 _a (0%)	229 _b (100%)
Depression cutoff				
Below cutoff	1,360 (90%)	969 (99%)	273 (91%)	118 (52%)
Meet cutoff	144 (10%)	6 _a (1%)	27 _b (9%)	111 _c (48%)
Posttraumatic stress cutoff				
Below cutoff	1,398 (93%)	963 (99%)	248 (83%)	187 (82%)
Meet cutoff	106 (7%)	12 _a (1%)	52 _b (17%)	42 _b (18%)
Moral injury cutoff				
Below cutoff	870 (57.8%)	774 (79.4%)	19 (6.3%)	77 (33.6%)
Meet cutoff	634 (42.2%)	201 _a (20.6%)	281 _c (93.7%)	152 _b (66.4%)
Functioning cutoff				
Below cutoff	771 (51.3%)	754 (77.3%)	0 (0.0%)	17 (7.4%)
Meet cutoff	733 (48.7%)	221 _a (22.7%)	300 _b (100.0%)	212 _c (92.6%)
Continuous variable	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
<i>M</i> _{age}	46.11 (11.30)	47.49 _a (11.72)	43.47 _b (10.23)	43.69 _b (9.68)
Mean social support (range = 1–5)	3.32 (0.93)	3.40 _a (0.95)	3.30 _a (0.82)	3.01 _b (0.92)
Mean COVID-19 stress (range = 1–5)	2.00 (0.91)	1.77 _a (0.77)	2.33 _b (0.91)	2.52 _c (1.08)
Pandemic-related work stressors total score (range = 0–14)	5.55 (3.76)	4.85 _a (3.48)	6.86 _b (3.79)	6.79 _b (4.10)
Proportion of patients with COVID-19-related problems	3.28 (1.37)	3.13 _a (1.37)	3.49 _b (1.33)	3.62 _b (1.35)
Anxiety total score (GAD-2; range = 0–6)	1.16 (0.37)	0.62 _a (0.84)	1.26 _b (0.78)	4.04 _c (1.05)
Depression total score (PHQ-2; range = 0–6)	1.10 (0.29)	0.34 _a (0.67)	1.10 _b (1.15)	2.60 _c (1.62)
Posttraumatic stress total score (PC-PTSD; range = 0–5)	1.07 (0.26)	0.67 _a (0.97)	1.93 _b (1.45)	2.05 _b (1.53)
Mean moral injury (MISS-HF items; range = 1–5)	1.42 (0.49)	1.49 _a (0.72)	2.76 _c (0.74)	2.56 _b (1.12)
Psychosocial functioning difficulties total score (range = 0–3)	0.74 (0.92)	0.30 _a (0.61)	1.49 _b (0.72)	1.66 _c (0.93)

Note. Means with the same subscript are not significantly different. GAD-2 = Generalized Anxiety Disorder-2; PHQ-2 = Patient Health Question-2; PC-PTSD = Primary Care PTSD Screen for *DSM-5*; *DSM-5* = *Diagnostic and Statistical Manual of Mental Disorders, fifth edition*; MISS-HF = Moral Injury Symptom Scale–Healthcare Professionals Version.

Table 2*Fit Indices for Latent Class Models*

No. classes	Log-likelihood	df	BIC	aBIC	AIC	cAIC	Entropy	Likelihood ratio test	Likelihood ratio test <i>p</i>	Pearson χ^2 goodness of fit	χ^2 <i>p</i>	Smallest class size
1	-3584.16	26	7204.89	7178.31	7178.31	7209.89						1,504
2	-3234.22	20	6548.92	6490.44	6513.97	6559.92	0.72	106.90	0.00	107.67	0.00	306
3	-3187.97	14	6500.32	6409.95	6446.31	6517.32	0.80	14.41	0.00	13.48	0.00	229
4	-3184.79	8	6537.84	6415.58	6464.78	6560.84	0.74	8.03	0.00	6.56	0.01	68
5	-3182.97	2	6578.10	6423.94	6485.98	6607.10	0.68	4.40	0.04	3.08	0.08	66
6	-3180.87	-4	6617.80	6431.74	6506.62	6652.80		0.20	0.65	0.21	0.65	6

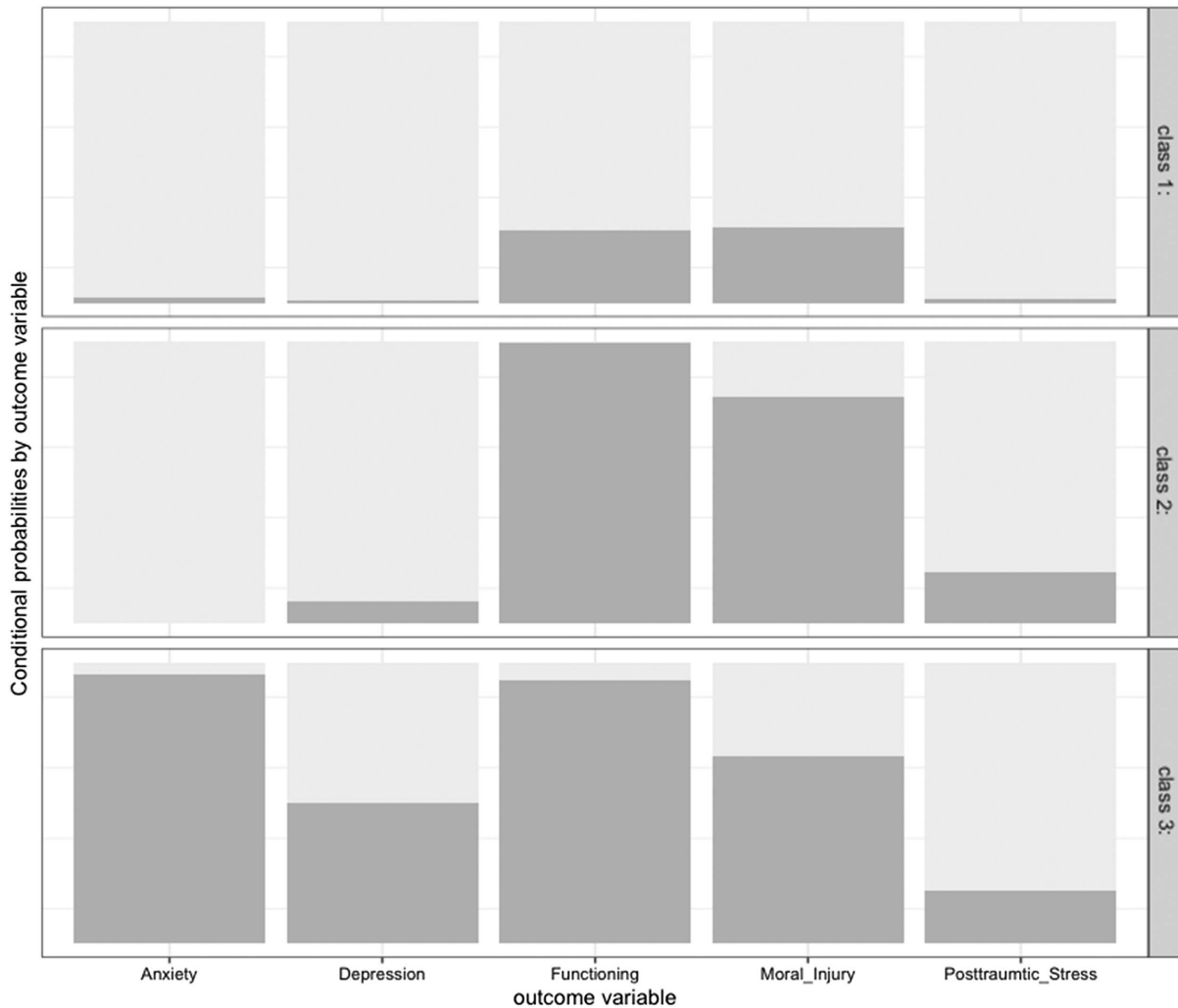
Note. Values in bold denote the accepted model. BIC = Bayesian information criterion; aBIC = sample-size adjusted Bayesian information criterion; AIC = Akaike information criterion; cAIC = consistent Akaike information criterion.

Lewis, 2011). Provider age and gender; average perceived social and emotional support from family/friends, coworkers, and/or work supervisor; personal risk of COVID-19; pandemic-related work stressors; weekly COVID-19 caseload; and death of a patient due to

COVID-19 were explored (Supplemental Table 1). Of note, identifying as female versus male was only associated with a higher probability of inclusion in the High Moral Injury class (identifying as “other” was not included in this analysis due to low sample size). Increased

Figure 1

Plot Probability Estimates of a Three-Class Solution (1 = Not Probable [Light Gray], 2 = Probable [Dark Gray])



provider age was associated with a decreased likelihood of inclusion in either the High Moral Injury or the Elevated Symptoms classes versus the No/Low Symptom class. Increases in perceived social support were associated only with a decreased likelihood of inclusion in the Elevated Symptoms class versus the No/Low Symptom class, but not the High Moral Injury class. Increases in personal risk of COVID-19, pandemic-related work stressors, weekly COVID-19 caseload, and the death of a patient due to COVID-19 were all associated with increased probabilities of inclusion in the High Moral Injury and the Elevated Symptoms classes versus the No/Low Symptom class. The results of the latent class regression models are consistent with class comparisons summarized in Table 1.

Provider type, work setting, and community type were also explored (not included in Supplemental Table 1). For provider type, specialties included were primary care physician, pediatrician, nurse practitioner, and physician assistant. Results indicated that compared to primary care physicians, physician assistants, $exp(b) = 1.85, p = .05$, and nurse practitioners, $exp(b) = 1.67, p = .09$, were marginally more likely to be included in the High Moral Injury class, and pediatricians, $1/exp(b) = 1.79, p = .09$, were marginally less likely to be included in the Elevated Symptoms class. For work setting, those who primarily worked in an inpatient setting were more likely to be included in the High Moral Injury class than those who primarily worked in individual outpatient practice, $exp(b) = 3.05, p < .05$. For community type, the only difference was a decreased likelihood of being in the High Moral Injury class for those who worked in suburban areas versus urban areas, $exp(b) = .61, p < .05$.

Discussion

The purpose of the present study was to examine patterns in mental health symptoms in health care providers late in the COVID-19 pandemic and to examine any correlates of membership in the resultant classes. Three patterns were identified as follows: (a) No/Low Symptoms, (2) High Moral Injury, and (3) Elevated Symptoms classes. Most of the sample (64.8%) was classified in the No/Low Symptoms group. This result is remarkably similar to Galatzer-Levy et al.'s (2018) review, where 65.7% of people exposed to potentially traumatic events were found to be resilient in 54 studies of response trajectories across multiple types of traumas, populations, and outcomes. However, this comparison is difficult to interpret given differences in exposure to PMIEs in the events included in the review and the education and training of health care providers as compared to the general population. Few studies have focused on resilience in health care workers as measured by resilient outcomes, more often using self-report resilience scales, which have been found to not be reliably associated with resilient outcomes (see Bonanno et al., 2024). While higher education has (inconsistently) been found to buffer against the adverse effects of exposure to potentially traumatic events (e.g., Bonanno et al., 2024) and PMIEs (Hall et al., 2022), several prepandemic studies have shown that health care workers are exposed to high levels of chronic stress and demonstrate higher levels of mental health difficulties (National Academies of Sciences, Engineering, and Medicine, 2019), suggesting that any buffering effect from higher education may be lost in this population. Data are limited on resilient outcomes in other professions involving life-or-death decision-making or having a high potential for harm to others. Several studies have found higher rates of resilience in military personnel, and a more limited number of studies have found that police and firefighters also demonstrate higher

levels of resilience (see Galatzer-Levy et al., 2018, for a discussion). However, as noted by Galatzer-Levy and colleagues, these populations, unlike health care professionals, are more likely to receive specific training and ongoing support for coping with exposure to adverse life events.

It is notable that by late 2022, when the COVID-19 pandemic's intensity had substantially decreased, a substantial proportion of health care providers surveyed reported high levels of psychological distress and functional difficulties. Our analyses found that 20% of the sample was classified in the High Moral Injury class with an additional 15% classified in the Elevated Symptoms class. Given the present study differed markedly in methodology from previous studies both in the variables included in the LCA and in the focus of the measure of moral injury, the most notable finding from this approach was the identification of a class characterized by high levels of moral injury and psychosocial functioning difficulties with low to moderate levels of PTSD symptoms. This finding highlights the importance of assessing moral injury as an outcome that may have its unique effect on psychosocial functioning separate from traditionally assessed categories of mental health.

Unsurprisingly, factors related to increased exposure to opportunities to experience trauma or moral injury (e.g., more COVID-19 patients), increased exposure to situations with higher potential for harm (e.g., providing care in the context of staffing and supply shortages, lack of institutional guidance, longer hours, feeling burnt out), and fear of the consequences of personally contracting COVID-19 all contributed to increased likelihood of being categorized in both the Moral Injury and Elevated Symptoms classes.

Other factors examined appeared to affect the likelihood of inclusion within a particular class. Those who identified as female were no more likely to be in the Elevated Symptom class than those who identified as male given exposure to the same or similar potentially traumatic events in the sample. However, females were more likely to be included in the High Moral Injury class. In this study, females were more likely to be nurse practitioners (83.5% vs. 16.5% for males) or physician assistants (71.1% vs. 28.9%) rather than primary care physicians (29.8% vs. 70.2%) making it unclear if the higher probability of inclusion in the High Moral Injury class was related to participants' sex, or issues of power, status, and self-determination during care provision. Also of note was that social support only affected the probability of inclusion in the Elevated Symptoms class, not the High Moral Injury class. Increases in perceived social support have reliably been associated with decreases in mental health symptoms across many domains across many decades, including in U.S. adults during the COVID-19 pandemic (e.g., Guerin et al., 2021). The lack of association between social support and moral injury in this study may be a product focusing on shame in measuring moral injury in this study and the propensity for those experiencing high levels of shame to hide their perceived offenses and avoid support for these issues (e.g., Swerdlow et al., 2023).

While these findings need replication, they speak to employers' important role in preventing psychosocial difficulties in the aftermath of experiencing potentially morally injurious events. This could take many forms but might include the transparent development of specific operating procedures for (a) handling mass casualty events with relevant partners and community members, (b) procedures for evaluation and adaption during implementation that includes all interested parties, (c) regular (re)evaluation of necessary resources for implementation of these procedures, (d) regular training with relevant

personnel on the implementation of these procedures as well as the impacts of exposure to PMIEs in settings such as in-services and grand rounds at the clinical level but also for supervisors and leaders on ways to support frontline workers during these events, (e) the creation of safe spaces to discuss personal issues related to exposure to moral injury, and (f) the establishment of regular reporting channels and standards for clear and open communication across all levels of the organization during the implementation of these procedures.

Limitations

Several potential limitations frame these findings. The cross-sectional design did not allow an examination of the identified classes' stability, the predictive value of any of the identified correlates of probable class membership in the sample over time, or the direction of causality in the relationships identified. In addition, the resultant classes may be sample-specific and limited by convenience sampling and self-selection in this opt-in panel survey limiting the generalizability of these findings. Further, primary care physicians were overrepresented in the sample. While provider type did not influence the probability of class membership at statistically significant levels, it does appear that there may have been a trend in the difference between nonphysician and physician groups such that if equal numbers of nurse practitioners and physician assistants had been recruited, these differences may have been statistically significant. The survey did not capture health care providers who may have left the workforce and so may have underestimated the effects found. In addition, information about whether providers were working full-time or part-time was not collected, which may influence the interpretation of the effect of the percentage of COVID-19 patients seen each week at the height of the pandemic as a predictor of class membership. In terms of measurement, the Primary Care PTSD Screen ascertained responses "as a result of being a health care provider during the COVID-19 pandemic," but did not directly ascertain specific events or experiences thus limiting the inferences made in this study. Given that the measure of moral injury was based on the Moral Injury Symptom Scale–Healthcare Professionals Version, institutional and societal betrayal, measured in other moral injury scales, was not included in this study. However, given the specific social context of care provision during the pandemic, perceived institutional and societal betrayal may be important factors contributing to outcomes measured in this study. As previously noted, this study was limited by the focus on guilt and shame in the measurement of moral injury.

Conclusions

This study adds to the growing literature documenting the ongoing psychological burdens that health care providers experienced approximately 2.5 years into the COVID-19 pandemic. The study also adds to the extant literature by highlighting the important role of moral injury in health workers' experience of the pandemic. The identified correlates associated with membership in the High Moral Injury and Elevated Symptoms classes are consistent with other studies examining moral injury and mental health difficulties in health care providers which together identify both person-level and organizational-level factors. These factors include age, sex, death of a patient due to COVID-19, fears of infection, work stressors, and perceived availability of social and emotional support that can be both the focus of tailored individual treatment protocols as well as organizational-

level efforts to provide support and resources to address these issues, manage work environments contributing to these difficulties, and policy-making for future pandemics. While replication of these results addressing the limitations of the present study is required, these findings emphasize the need to develop, implement, and empirically evaluate programming to prevent ongoing problems in mental health, moral injury, and psychosocial functioning in the U.S. health care provider workforce.

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