

COVID-19 Traumatic Disaster Appraisal and Stress Symptoms Among Health Care Workers

Insights From the Yale Stress Self-assessment

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Objective: To determine to what extent did health care workers experience the pandemic as a severe stress event. **Methods:** This cross-sectional evaluation of 8299 health care workers, representing a 22% response rate, utilized machine learning to predict high levels of escalating stress based on demographics and known predictors for adverse psychological outcomes after trauma. **Results:** A third of health care workers experienced the pandemic as a potentially traumatic stress event; a greater proportion of health care workers experienced high levels of escalating stress. Predictive factors included sense of control, ability to manage work-life demands, guilt or shame, age, and level of education. Gender was no longer predictive after controlling for other factors. Escalating stress was especially high among nonclinical academics and clinical private practitioners. **Conclusion:** Findings suggest adverse effects on total worker health, care quality, professionalism, retention, and acute and chronic mental health.

Keywords: COVID-19, coronavirus, disaster, mental health, moral injury, occupational health, pandemic, population health, psychological first aid, trauma

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†Dr Steven Southwick passed away during the publication process of this manuscript. A world-renowned expert in psychiatry, trauma, and resilience, he made meaningful contributions to this article. He was greatly influential in the lives and careers of many. He will be greatly missed and long remembered.

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Ethical considerations: The system-wide leadership group overseeing mental health support recommended collecting few personal identifiers, so not to discourage participation. Participation was anonymous. The Yale Stress Self-assessment was designed for quality improvement and care for the caregivers during the pandemic. Yale School of Medicine Institutional Review Board was consulted and approved the work as exempt.

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The eruption of the global COVID-19 pandemic put enormous strain on health care systems and health care workers.^{1,2} It posed a mortal threat to populations and disrupted businesses and social services. It threatened people's sense of safety and security and is expected to have adverse effects on mental and physical health.^{3,4} Early reports described emotional distress among health care workers who continue to manage the occupational demands of caring for patients.⁵⁻²⁰ For many, health care work was potentially traumatic as it involved excessive exposure to death, threat of death perceived for oneself or loved ones, and repeated exposure to information about risk and vulnerability.²¹

The Yale Stress Self-assessment (YSSA) was established to determine how health care workers across demographics appraised the pandemic stress event, their overall level of stress, and constellation of stress symptoms. The YSSA served as part of an institutional response to provide psychological first aid and mental health support. We aimed to know the proportion and severity of those experiencing high levels of escalating stress, who may be at risk of adverse psychological consequences and in need of mental health support. We hypothesized that the pandemic experience may have been perceived as a traumatic event and would predict escalating stress symptoms and the need for sustained support beyond the acute phase of the pandemic.

METHODS

Setting and Participants

This evaluation began during the acute phase of the pandemic when Code D (Disaster) was first declared (mid-March 2020) as the number of patients with the highly contagious novel virus escalated and non-essential health care activities were suspended, and lasted until the transformation phase when the health system started to reopen for all clinical services (mid-June, 2020). The health care system ranged 35 to 142 miles from the pandemic epicenter in New York City and comprised five hospital-based delivery networks serving diverse populations in urban, suburban, and rural areas. This was the time governments first recommended that citizens socially distance, wear masks, and isolate at home; schools and businesses were frequently shuttered; and supply chains for essential goods and services were disrupted. The virus was novel with escalating fatalities, before the development of vaccines or treatments.

Approximately 40,000 health care workers affiliated with the system were offered the YSSA via digital link embedded in e-mails from leadership or available on the Care for the Caregivers Web site. Eligible participants were those affiliated with the school of medicine (predominantly medical students and researchers, excluding clinical faculty), academic clinical faculty (predominantly physician specialists), employed clinical staff (predominantly hospitalists and primary care physicians), community private practice clinicians, and others employed by the health system (including nurses and allied health care workers) across levels of education, age, and gender. Responses were collected on a rolling basis (Fig. 1).

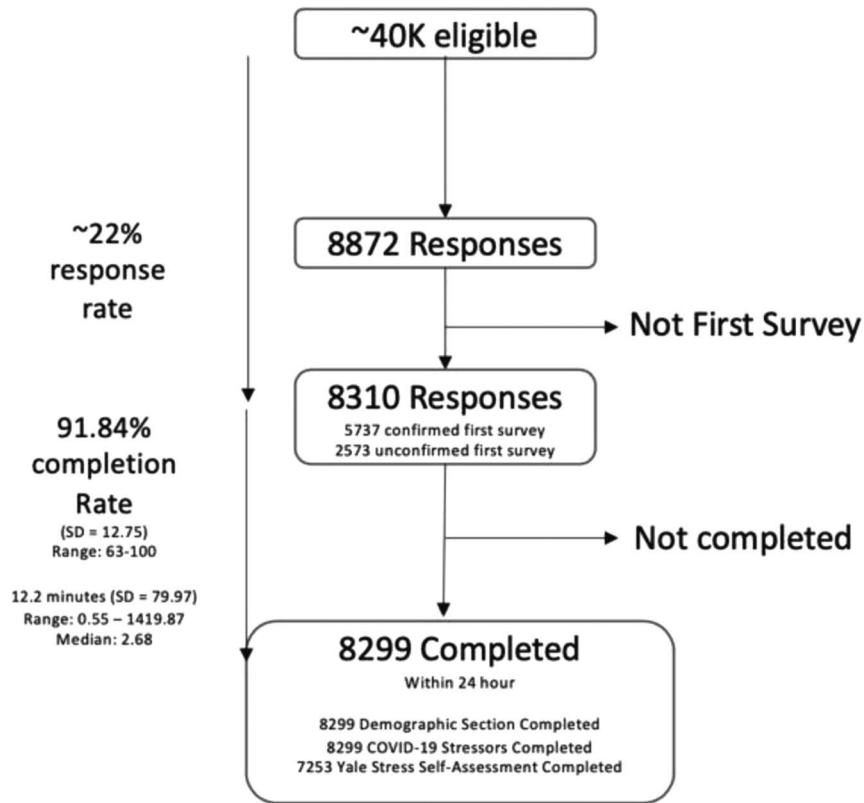


FIGURE 1. Inclusion/exclusion flow diagram.

Yale Stress Self-assessment V.1

The YSSA V.1 is brief and anonymous to facilitate rapid self-appraisal of the stress event and signs and symptoms of stress. Participants received immediate feedback on their stress levels with links to psychological first aid such as self-care, peer support, and mental health professionals. The system-wide leadership group overseeing mental health support recommended collecting few personal identifiers, so not to discourage participation. Respondents' initial survey completions were included in this evaluation.

Part A: Appraisal of the stress event utilized five questions crafted from previously published models: a single item combines key aspects defining an acute traumatic stress event (exposure to or threat of death for self, others, and loved ones),²¹ three risk factors related to adverse psychological outcomes after a traumatic stress event (lack of control, sense of guilt or shame, or blaming others),^{22,23} and an item on the ability to manage work-family demands.²⁴ Items were rated on a 5-point Likert scale ranging from “never” to “very often,” or “not at all” to “most definitely.” A high score indicated stressors appraised to be “fairly often/very often” or “definitely/most definitely.” Part A of the YSSA was found to have good internal consistency with a Cronbach α of 0.72. (Appendix A, <http://links.lww.com/JOM/B183>).

Part B: Stress symptoms were appraised using 16 of the most common stress symptoms across the mental, physical, and behavioral health domains of the American Psychological Association's Acute Stress Disorder diagnostic criteria²¹ and the Stress in America Survey.²⁵ Participants provided a binary response (endorsement or not) of escalating symptoms “three or more times per week.” High scorers endorsed 5+ symptoms. In exploratory and confirmatory factor analysis of the 16 items, all were retained as a single construct with eigenvalues >1.0 and factor loadings >0.63 (except alcohol use with factor loading of 0.51). The YSSA part B subscale had excellent internal consistency with Cronbach α of 0.87 (Appendix A, <http://links.lww.com/JOM/B183>).

Statistical Analysis

Standard descriptive statistics characterized the sample. Multiple logistic regression tested whether individual event stressors in part A (treated as continuous variables) predicted the likelihood of experiencing high stress symptoms in part B, accounting for age, gender, education, and timing of assessment (binned to May 15 to 21, May 22 to 29, and May 30 to June 22). Because of conceptual overlap between education and affiliation, only education was used in the model. A machine learning–based classification tree approach²⁶ identified the strongest predictors of high stress and assessed for embedded interactions. Predictors included the event stressors (part A) and demographic characteristics (age, gender, education, and timing of survey completion). The data were partitioned into a 70/30 split (training and test data sets) and fit using the rpart package, maximizing information gain (minimizing entropy).²⁷ The tree was initially overfit and pruned using 10-fold cross validation to minimize cross-validated error. Accuracy in both the training and test models was assessed. Data analyses were conducted in R v. 3.6.1.²⁸

RESULTS

Descriptive Statistics

The sample comprised 8299 first-time respondents, with 92% having completed the survey within 12 minutes. All 8299 participants completed part A (stress appraisal); 7253 individuals completed part B (stress symptoms) and were demographically similar to those who completed part A (Appendix B, <http://links.lww.com/JOM/B183>). The sample was 79% female, with an average age of 45.1 (SD, 12.9) years, grossly consistent with the health care system demographics at large. Most respondents were nonmedical clinical or nonclinical system employees (62%). Physicians accounted for 9%. Nonclinical individuals from the school of medicine (predominantly medical students and research scientists) comprised 16%. Younger participants

TABLE 1. Total Sample, High Stress Appraisal, and High Stress Symptoms by Demographics

		Total Sample	Moderate/High Stress Appraisal (10–20 Score)	Moderate/High Stress Symptoms (5–17 Symptoms)*
Age	<30 y	8299 (100)	2505 (30.2)	3871 (53.4)
	30–39 y	1094 (13.2)	523 (47.8)	677 (73.0)
	40–49 y	1876 (22.6)	743 (39.6)	1034 (63.5)
	50–59 y	1695 (20.4)	512 (30.2)	801 (53.9)
	≥60 y	1909 (23.0)	409 (21.4)	776 (45.9)
Gender	Female	1276 (15.4)	210 (9.6)	405 (35.6)
	Male	6547 (78.9)	2061 (31.5)	3189 (55.6)
	Nonbinary/unknown	1603 (19.3)	383 (23.9)	611 (43.8)
Education	Associates or less	149 (1.8)	61 (40.9)	71 (56.3)
	Bachelor's	2371 (28.6)	511 (21.6)	1036 (49.5)
	Master's	2725 (32.8)	923 (33.9)	1382 (57.5)
	Other doctoral	1803 (21.7)	575 (31.9)	837 (52.6)
	MD	645 (7.8)	238 (36.9)	335 (61.7)
Affiliation	MD	710 (8.6)	241 (33.9)	260 (44.2)
	Academic, nonclinical	1342 (16.2)	560 (41.7)	706 (63.4)
	Academic, clinical faculty	581 (7.0)	185 (31.8)	240 (50.8)
	Health system employees, nonmedical clinical, nonclinical	5152 (62.1)	1423 (27.6)	2398 (51.9)
	Employed, medical staff	698 (8.4)	162 (23.2)	282 (46.3)
	Private practice	411 (5.0)	146 (35.5)	189 (60.2)

Within-variable percentages do not tally to 100, because a certain portion of the sample declined to answer on one or more demographic questions. The unaccounted-for percentage reflects this. Sample percentages are out of the whole sample; stress score percentages are by row. Moderate/high = high. A low stress appraisal score was indicated by participants averaging less than a “sometimes”/“somewhat” (<2) on the scale. A low stress symptom score was characterized by endorsing less than a third of the possible stress symptoms (<5).

*There were 7253 participants who completed the stress symptoms section; percentages reflect total out of this number. Values in bold font represent significantly greater odds ratios, and italicized values represent a significantly lower odds ratios of experiencing the symptom at medium/high rate relative to all other demographic subgroups.

MD, medical doctor.

(<30 years old) and those who identified as nonbinary/nondisclosed gender, academic nonclinical workers displayed the highest levels of stress appraisal and stress symptoms (*P*'s < 0.05) (Table 1).

Appraisal of COVID-19 Event Stressors (Predictors)

Of the 8299 respondents, 32% reported death or threat of death fairly or very often, which appeared evenly distributed across demographics. Thirty percent reported difficulty managing demands, 21% felt out of control, 17% felt guilt or shame over their actions or inactions, and 11% blamed others. Guilt/shame or blame trended upward

with each tier of higher education, among academics versus nonacademics, among medical doctors (MDs) versus non-MDs. Those male, older, or MD less frequently endorsed feeling out of control. The young, female, non-MD endorsed feeling most out of control, as did the nonclinical academicians and private practitioners (Table 2).

Stress Symptoms (Outcomes)

Of the 7253 who completed part B (stress symptoms), 53% had high degrees of escalating stress. During this phase of the pandemic, feeling “tired, exhausted, fatigued” and “sleep difficulties” were most

TABLE 2. Event Stressors by Demographics

		Exposure to Death	Manage Work-Family Demands	Feeling Out of Control	Guilt-Shame of Action/Inaction	Blame
Age	<30 y	2655 (32.0)	2528 (30.5)	1763 (21.2)	1401 (16.9)	918 (11.1)
	30–39 y	365 (33.4)	432 (39.5)	412 (37.7)	363 (33.2)	197 (18.0)
	40–49 y	606 (32.3)	757 (40.4)	514 (27.4)	439 (23.4)	255 (13.6)
	50–59 y	562 (33.2)	555 (32.7)	341 (20.1)	260 (15.3)	167 (9.9)
	≥60 y	618 (32.4)	437 (22.9)	260 (13.6)	187 (9.8)	166 (8.7)
Gender	Female	337 (26.4)	216 (16.9)	143 (11.2)	100 (7.8)	86 (8.7)
	Male	2187 (33.4)	2066 (31.6)	1464 (22.4)	1150 (17.6)	679 (10.4)
	Nonbinary/unknown	409 (25.5)	407 (25.4)	252 (15.7)	216 (13.5)	213 (13.3)
Education	Associates or less	59 (39.6)	55 (36.9)	47 (31.5)	35 (23.5)	26 (17.5)
	Bachelor's	776 (32.7)	606 (25.6)	400 (16.9)	212 (8.9)	176 (7.4)
	Master's	955 (35.0)	882 (32.4)	665 (24.4)	519 (19.0)	342 (12.6)
	Other doctoral	549 (30.4)	555 (30.8)	377 (20.9)	356 (19.7)	197 (10.9)
	MD	144 (22.3)	243 (37.7)	160 (24.8)	166 (25.7)	104 (16.1)
Affiliation	MD	215 (30.3)	227 (32.0)	149 (21.0)	139 (19.6)	90 (12.7)
	Academic, nonclinical	530 (39.5)	301 (22.4)	404 (30.1)	418 (31.1)	229 (17.1)
	Academic, clinical faculty	175 (30.1)	177 (30.5)	124 (21.3)	105 (18.1)	57 (9.8)
	Health system employees, nonmedical clinical, nonclinical	1482 (28.8)	1812 (35.2)	1010 (19.6)	706 (13.7)	499 (9.7)
	Employed, medical staff	187 (26.8)	208 (29.8)	104 (14.9)	69 (9.9)	62 (8.9)
	Private practice	133 (32.4)	125 (30.4)	88 (21.4)	88 (21.4)	54 (13.1)

TABLE 3. Stress Symptom by Demographics

		Tired, Exhausted, Fatigued	Sleep Difficulties	Irritable, Frustrated Emotional	Anxious, Tense, Nervous	Losing Focus/ Concentration	Forgetting Things	Distant and Cut off From People	Headaches
Age	<30 y	4898 (67.5)	4128 (56.9)	4035 (55.6)	3941 (54.3)	2932 (40.4)	2715 (37.4)	2564 (35.4)	2259 (31.3)
	30–39 y	747 (80.6)	613 (66.1)	672 (72.5)	668 (72.1)	518 (55.9)	419 (45.2)	428 (46.2)	428 (46.2)
	40–49 y	1239 (76.1)	972 (59.7)	1075 (66.0)	1031 (63.3)	775 (47.6)	702 (43.1)	628 (38.6)	636 (39.0)
	50–59 y	1030 (69.4)	864 (58.2)	879 (59.2)	830 (55.9)	591 (39.8)	583 (39.3)	507 (34.1)	488 (32.9)
	≥60 y	1029 (60.9)	927 (54.8)	805 (47.6)	798 (47.2)	581 (34.4)	570 (33.7)	528 (31.2)	417 (24.7)
Gender	Female	602 (52.9)	545 (47.8)	410 (36.0)	436 (38.3)	334 (29.3)	316 (27.7)	362 (31.8)	183 (16.1)
	Male	3953 (69.0)	3376 (58.9)	3296 (57.5)	3267 (57.0)	2391 (41.7)	2244 (39.2)	2114 (36.9)	1944 (33.9)
	Nonbinary/unknown	854 (61.2)	676 (48.4)	666 (47.7)	602 (43.1)	485 (34.7)	427 (30.6)	403 (28.9)	267 (19.1)
Degree	Associates or less	91 (72.2)	76 (60.3)	73 (57.9)	72 (57.1)	56 (44.4)	44 (34.9)	47 (37.3)	48 (38.1)
	Bachelor's	1394 (66.6)	1188 (56.7)	1043 (49.8)	1043 (49.8)	753 (36.0)	793 (37.9)	685 (32.7)	733 (35.0)
	Master's	1676 (69.7)	1438 (59.8)	1427 (59.3)	1402 (58.3)	1017 (42.3)	968 (40.2)	916 (38.1)	825 (34.3)
	Other doctoral	1082 (68.1)	895 (56.3)	904 (56.9)	865 (54.4)	650 (40.9)	583 (36.7)	582 (36.6)	444 (27.9)
	MD	361 (66.5)	308 (56.7)	329 (60.6)	334 (61.5)	286 (52.7)	190 (35.0)	196 (36.1)	136 (25.0)
Affiliation	Academic, nonclinical	360 (61.2)	281 (47.8)	313 (53.2)	278 (47.3)	211 (35.9)	160 (27.2)	173 (29.4)	111 (18.9)
	Academic, clinical faculty	758 (68.1)	654 (58.8)	717 (64.4)	708 (63.6)	631 (56.7)	419 (37.6)	422 (37.9)	347 (31.2)
	Health system employees, nonmedical clinical, nonclinical	317 (67.2)	242 (51.3)	251 (53.2)	250 (53.0)	210 (44.5)	157 (33.3)	165 (35.0)	109 (23.1)
	Employed, medical staff	3157 (68.4)	2669 (57.8)	2502 (54.2)	2464 (53.4)	1719 (37.2)	1785 (38.7)	1659 (35.9)	1474 (31.9)
Private practice	382 (62.7)	316 (51.9)	322 (52.9)	291 (47.8)	185 (30.4)	198 (32.5)	162 (26.6)	190 (31.2)	
		224 (71.3)	189 (60.2)	194 (61.8)	178 (56.7)	149 (47.5)	124 (39.5)	124 (39.5)	106 (33.8)

Numbers represent a count of people who endorsed the symptom (% within each row). The percentages in the first column reflect out of the sample completing this section (n = 7253). MD, medical doctor.

common at 68% and 57%, respectively. Feeling “irritable, frustrated, and emotional” (56%) and “anxious, tense, and nervous” (54%) were frequent. Health care workers endorsed “losing focus” (20%) and “more forgetfulness” (37%). Depressive symptoms, “losing interest, numb,” “lonely, helpless,” and “down and hopeless,” were reported by 20%, 23%, and 29%, respectively. More than a third of respondents felt more “distant and cut off” from people, 16% had increased alcohol use, 18% expressed “grief and loss,” and 15% reported rumination on events. Somatic complaints “aches and pains” and headaches were less frequent for each decade older, with each tier of higher education, in males compared with females. Nonclinical academicians (predominantly researchers and medical school administrators) and clinicians in private practice registered relatively higher frequencies of escalating stress across the spectrum of symptoms (except fewer somatic complaints). (Table 3) Respondents shared other signs or symptoms of stress, including overeating or loss of appetite, not exercising, feeling overwhelmed, crying more often or easily, anger, missing family and loved ones, worry about loved ones getting sick, nausea, shortness of breath, chest pain or heart palpitations, and increased blood pressure.

Classification tree modeling revealed that feeling out of control (“sometimes” or greater) paired with lack of confidence managing demands (“sometimes” or “fairly often,” depending on the node), guilt/shame, or age younger than 50 years predicted escalating high stress for majority of the sample. Gender was not predictive, when controlling for other factors (Fig. 2). Accuracy of this model was good and stable, with 75.5% in the training data set and 74.9% in the test data set.

More respondents had high escalation of stress symptoms than had appraised the event as stressful event. This proportional incongruence between event appraisal and stress symptoms existed observationally for approximately 32% of the sample (Appendix D, <http://links.lww.com/JOM/B183>). Per classification tree accuracy, event appraisal predicting stress symptoms was similarly disproportionate in approximately 25% of the sample. This was the case more so in women than in men (OR, 1.20; 95% CI, 1.05 to 1.38; $P < 0.001$) and those 40 to 49 years old than other age groups (ORs, 1.23 to 1.62; P 's < 0.008). Of the demographic groups, only MDs compared with non-MDs had a smaller proportion with rising stress than the proportion who appraised the event as traumatically stressful, an inverse pattern for others.

Appraisal of COVID-19 Stressors Predicting Stress Symptoms

In multiple logistic regression accounting for age, gender, education, and time period of survey completion, each event stressor was statistically predictive of high stress symptoms. Lack of confidence managing demands (odds ratio [OR], 1.77; 95% confidence interval [95% CI], 1.66 to 1.89; $P < 0.001$) and feeling out of control (OR, 1.69; 95% CI, 1.59 to 1.81; $P < 0.001$) were the strongest predictors. The other items were also significantly associated with high stress (guilt/shame: OR, 1.34 [CI, 1.32 to 1.36; $P < 0.001$]; exposure to or threat of death: OR, 1.25 [95% CI, 1.18 to 1.32; $P < 0.001$]; blaming others: OR, 1.12 [95% CI, 1.06 to 1.18; $P < 0.001$]) (Appendix C, <http://links.lww.com/JOM/B183>).

DISCUSSION

This system-wide cross-sectional evaluation of health care workers' and professionals' experiences in the acute phase of the pandemic found that a third of respondents reported excessive exposure to or threat of death for self or others, suggesting the pandemic may have been experienced as traumatic. A majority of the workforce reported escalating high stress symptoms. Lack of control and inability to manage demands were the most common and predictive of escalating high stress levels, especially in combination with guilt. To a lesser extent, age younger than 50 years, less than a college degree or absence of a medical degree, and blaming others were also independent predictors of escalating stress.

TABLE 3. Stress Symptom by Demographics, Continued

Feeling Down and Hopeless	Aches and Pains	Racing or Slowing Thoughts	Feeling Lonely and Helpless	Losing Interest or Feeling Numb	Feeling Grief and Loss	Alcohol Use	Dwelling on Past Events	Other Signs
2081 (28.7)	1910 (26.3)	1689 (23.3)	1638 (22.6)	1424 (19.6)	1293 (17.8)	1132 (15.6)	1082 (14.9)	307 (4.2)
398 (42.9)	293 (31.6)	375 (40.5)	356 (38.4)	308 (33.2)	182 (19.6)	202 (21.8)	276 (29.8)	22 (2.4)
565 (34.7)	477 (29.3)	499 (30.6)	434 (26.6)	394 (24.2)	305 (18.7)	297 (18.2)	308 (18.9)	52 (3.2)
413 (27.8)	398 (26.8)	328 (22.1)	330 (22.2)	270 (18.2)	256 (17.2)	253 (17.0)	187 (12.6)	54 (3.6)
385 (22.8)	412 (24.4)	287 (17.0)	284 (16.8)	250 (14.8)	298 (17.6)	209 (12.4)	162 (9.6)	95 (5.6)
224 (19.7)	224 (19.7)	130 (11.4)	150 (13.2)	141 (12.4)	179 (15.7)	116 (10.2)	96 (8.4)	65 (5.7)
1706 (29.8)	1573 (27.4)	1377 (24.0)	1341 (23.4)	1107 (19.3)	1091 (19.0)	853 (14.9)	845 (14.7)	244 (4.3)
335 (24.0)	302 (21.6)	286 (20.5)	261 (18.7)	285 (20.4)	171 (12.2)	253 (18.1)	209 (15.0)	59 (4.2)
40 (31.7)	35 (27.8)	26 (20.6)	36 (28.6)	32 (25.4)	31 (24.6)	26 (20.6)	28 (22.2)	4 (3.2)
525 (25.1)	637 (30.4)	411 (19.6)	388 (18.5)	349 (16.7)	366 (17.5)	263 (12.6)	263 (12.6)	98 (4.7)
759 (31.6)	711 (29.6)	652 (27.1)	640 (26.6)	536 (22.2)	449 (18.7)	423 (17.6)	420 (17.5)	102 (4.2)
443 (27.9)	355 (22.3)	390 (24.5)	352 (22.1)	302 (19.0)	295 (18.6)	265 (16.7)	209 (13.1)	73 (4.6)
195 (35.9)	108 (19.9)	134 (24.7)	148 (27.3)	129 (23.8)	90 (16.6)	83 (15.3)	100 (18.4)	17 (3.1)
151 (25.7)	90 (15.3)	97 (16.5)	102 (17.3)	103 (17.5)	88 (15.0)	93 (15.8)	82 (13.9)	15 (2.6)
450 (40.4)	250 (22.5)	337 (30.3)	350 (31.4)	299 (26.9)	196 (17.6)	215 (19.3)	229 (20.6)	43 (3.9)
148 (31.4)	95 (20.1)	106 (22.5)	92 (19.5)	95 (20.1)	77 (16.3)	72 (15.3)	77 (16.3)	13 (2.8)
1207 (26.1)	1301 (28.2)	1046 (22.7)	990 (21.4)	843 (18.3)	836 (18.1)	708 (15.3)	635 (13.7)	201 (4.4)
143 (23.5)	143 (23.5)	90 (14.8)	105 (17.2)	83 (13.6)	110 (18.1)	72 (11.8)	73 (12.0)	31 (5.1)
106 (33.8)	90 (28.7)	92 (29.3)	78 (24.8)	88 (28.0)	59 (18.8)	50 (15.9)	57 (18.2)	15 (4.8)

Pandemic as a Traumatic Disaster

Scholars debate whether the pandemic qualifies as a traumatic event, defined as exposure to or threat of death to self or others, and whether the pandemic is characteristic of a disaster, defined as posing a mortal threat to a large group of people and disrupting resources, services, and social networks.^{21,23,29,30} We found evidence to support both, as a third of health care workers appraised the COVID-19 event as traumatic fairly to very often. It is conceivable that 15% to 35% of our population has risk factors for posttraumatic stress disorder (PTSD), as discussed below.

Sense of Control

Congruent with our findings, other pandemic research corroborated that sense of control predicted the presence or absence of high

psychological stress.^{11,14} It has been previously described that helplessness limited latitude of control associated with adverse mental and physical health.³¹⁻³³ The presence of control, self-efficacy, and accomplishment have been associated with well-being.^{23,34-36} Health care workers may have experienced lack of control as high patient volume, absent knowledge or treatment to prevent morbidity and mortality due to the novel virus, lack of lifesaving equipment (eg, ventilators), and uncertainty about personal protective equipment and one's own safety, compounded by the disruption to critical operations of daily life. Nonclinical academicians (predominantly researchers, medical students, administrators) may have experienced disruption to research and education, as was previously reported to have increased stress during the pandemic.³⁷ Private practitioners experienced disruption to their practices (eg, abrupt cessation of activities and revenue to

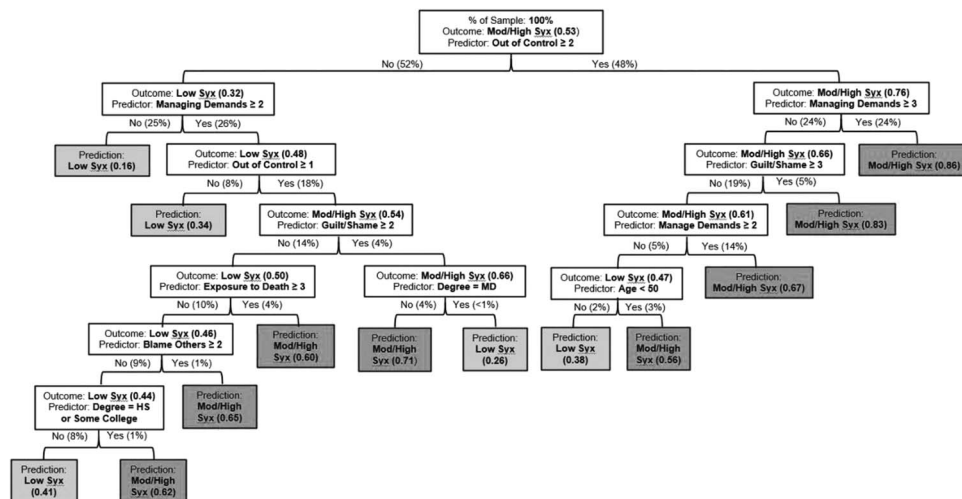


FIGURE 2. Decision tree predicting high stress symptoms.

sustain payroll, and emergent adoption of telemedicine to connect with patients).⁵⁸ Medical practices and academic researchers conveyed need for economic relief.^{37,38} Other researchers found lack of control and inability to manage to be linked with financial and familial burden coupled with increased negative emotions.³⁹ These experiences may have been experienced as an existential threat to respondents' livelihood and identity.

Perhaps appraisal of stressors and stress symptoms were less for every decade older given the perspective that comes with age, providing a sense of control and ability to manage. Alternatively, those older than 60 years were often excused from direct patient care given the elevated risks if infected, perhaps increasing their sense of safety and control. Those 40 to 49 years old demonstrated a greater proportionate incongruence between event appraisal and stress symptoms, perhaps owing to other nonevent stressors, such as being the "sandwich generation" simultaneously caring for dependent children and elderly parents while society social distanced and isolated from support outside the home (eg, schools and day care).

Those identifying female reported higher frequencies of stressors and stress symptoms than male counterparts, consistent with other studies.^{5-7,10,13} Press widely reported women were disproportionately leaving the workforce because of competing work-life demands exacerbated by the pandemic.⁴⁰⁻⁴⁸ This could have serious ramifications for health care, which is 70% to 80% female.⁴⁹ After adjusting for factors such as control and ability to manage work-life demands, gender was no longer found to be an independent predictor of high stress, suggesting interventions that make work-life demands more manageable could reduce stress among the predominantly female workforce.

Guilt, Shame, Blame, and Moral Injury

Guilt, shame, and blame are hallmarks of "moral injury" for what one did or did not do when faced with a moral dilemma or potential breach of ethical beliefs.⁵⁰⁻⁵³ Possibly, during the acute first phase of the pandemic, health care workers experienced cognitive dissonance between their moral beliefs and their actions during the COVID-19 disaster. Perhaps, they had to ration lifesaving resources (eg, ventilator support), deny access to loved ones at their time of death, watch patients suffering alone in isolation, and did not see patients in person for fear of contracting the illness themselves or having passed infections to loved ones. Many were unable to save lives. Health care workers may harbor blame for the circumstances in which they found themselves, felt betrayed by those believed responsible to protect them. Some faced discrimination for fear they may be contagious. Because of negative self-appraisal and fear of being judged or cast out, as a result of disclosure, individuals may be reluctant to appraise these stressors or seek help. Our prevalence of 11% to 17% may be an underestimate. "Moral injurious incidents" have been associated with PTSD, depression, and suicide.⁵³ The potential for "moral injuries" warrants careful monitoring and skillful treatment.

Stress Appraisal

A third of the sample had a high appraisal of event stressors (part A), whereas more reported high stress symptoms (part B). This discrepancy may be due to the sensitivity of the instrument to detect stress, or lack of sensitivity to detect relevant stressors. Or, perhaps, the appraisal indicates lack of self-awareness, stoicism, tendency to minimize, or reluctance to disclose,⁵⁴⁻⁵⁷ risking underutilization of support services by trauma-exposed frontline providers as has been documented in military^{58,59} and civilian populations after other disasters.⁶⁰ This may be the case with MDs,^{56,57,61} which were the only group to report proportionately fewer overall symptoms of stress than recognition of event stressors. Or, perhaps, MDs perceived fewer event stressors because they felt a greater sense of control. Education may be a marker of authority, agency, and control and may thus be protective. The YSSA aimed to facilitate self-awareness of both stressors and stress symptoms, such that interventions that target these engage the participant

in prevention strategies against psychopathology. Future work would benefit from examining this further.

Stress Symptoms

Although acute traumatic stress has not been shown to definitely predict psychopathology,⁴ there are factors observed in our sample known to predict PTSD. These factors include avoidance and numbing symptoms,⁴ lack of social support (feeling lonely and cut off),⁴ and moral injury (marked by blame or guilt/shame).^{50,53} Thus, it is conceivable that 11% to 35% of our health care workforce have risk factors for psychopathology, such as PTSD. This is especially true in the absence of protective factors against adverse psychological outcomes reported by 20% to 57% of the sample with social isolation and sleep disturbance.^{62,63} Sleep and self-valuation have been shown to be protective.^{62,64,65} Unmanageable demands and poor self-efficacy (control) are likely to exacerbate preexisting burnout.³⁴ Most health care workers felt irritable, which may adversely affect professionalism. Given the high-stakes, complex decision-making required for patient care, the cognitive dysfunction reported by 20% to 37% may also pose a threat to patient safety, emphasizing the need to care for the caregivers.⁶⁶⁻⁶⁸

Limitations

There are several limitations to this evaluation. The data are cross-sectional; thus, we cannot make causal inferences. Although the brief YSSA has face validity and internal reliability, constructed from well-established instruments and peer-reviewed models, it has yet to be validated against the existing longer standard instruments. As referenced previously, findings were consistent with other research done among health care workers at this phase of the pandemic. Although the sample was large, the response rate was modest; yet, the proportion identifying as women and physicians in our sample grossly approximates that in health care and is similar to our previous system-wide surveys. As participation was voluntary and anonymous, it was not possible to determine if nonresponders experienced pandemic stress differently than responders. Meant to normalize a range of experiences, the invitation to participate states the pandemic was a burden for health care workers and the health care system, and it would be "natural to feel stressed." Future iterations of the YSSA may adopt more neutral language so as not to bias the reporting of stress symptoms. A link to the YSSA was embedded in e-mails from leadership and did not otherwise have dedicated marketing, which could explain the modest response rate, although this remains an opportunity for improvement. This evaluation represents a single large regional academic health care system across five hospital-based delivery networks during the acute phase of a global pandemic, which may limit generalizability. However, the findings may be representative of the acute pandemic experience among health care workers worldwide, thus critically relevant in psychological recovery from a globally traumatic event.

Implications

The YSSA is a discrete, fast, easy tool to rapidly self-assess a traumatic stress event and stress. It does not diagnose psychopathology and was thus designed to reduce fear of stigma and facilitate participation. It does provide stress awareness through scoring, potentially providing mental health support, saving lives, and improving well-being. The anonymized aggregated data prove useful for planning a response to care for caregiver well-being,¹ as such tools have done in other disaster situations.⁴ Results were presented to the community of health care workers and professionals. Anecdotally, the health care workers and professionals expressed relief that their individual experience was reflected in the data, commonly shared by those around them, and explained their observations of colleagues.

The YSSA symptomatology seems grossly consistent with stress,^{7,14} anxiety,⁵⁻¹⁰ depression,^{12,13,16,69} rumination, bereavement, and exhaustion in patterns and proportions seen elsewhere during

the pandemic.^{5–20} This provided some face validity for the utility of the YSSA for traumatic disasters such as the pandemic. Given the pandemic is a unique type of disaster, different from other traumas that have been more widely studied (eg, combat, assaults, accidents),^{3,4} we believe these findings deepen our understanding of and response to future events.

CONCLUSION

Given these findings, it is critical caregivers recognize their risk factors and escalating stress and make self-care a professional priority and that organizations create a culture of wellness and make self-care possible to the greatest extent possible.⁶⁶ These findings suggest potential of psychopathology acutely and beyond the acute event, thus highlighting the need for easily accessible acute and long-term mental health care and comprehensive support for the well-being of health care workers. Comprehensive support includes creating a sense of control and ability to manage work-life demands.

Before the pandemic, top health care chief executive officers called burnout among medical professionals a “public health crisis.”⁶⁸ The National Academy of Medicine called clinician well-being essential to safe, high-quality patient care requiring immediate attention.⁷⁰ The pandemic has compounded the urgency in which the American health care industry must address health care worker and professional well-being.

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