

Impact of the Early Phase of the COVID-19 Pandemic on US Healthcare Workers: Results from the HERO Registry



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BACKGROUND: The HERO registry was established to support research on the impact of the COVID-19 pandemic on US healthcare workers.

OBJECTIVE: Describe the COVID-19 pandemic experiences of and effects on individuals participating in the HERO registry.

DESIGN: Cross-sectional, self-administered registry enrollment survey conducted from April 10 to July 31, 2020.

SETTING: Participants worked in hospitals (74.4%), outpatient clinics (7.4%), and other settings (18.2%) located throughout the nation.

PARTICIPANTS: A total of 14,600 healthcare workers.

MAIN MEASURES: COVID-19 exposure, viral and antibody testing, diagnosis of COVID-19, job burnout, and physical and emotional distress.

KEY RESULTS: Mean age was 42.0 years, 76.4% were female, 78.9% were White, 33.2% were nurses, 18.4% were physicians, and 30.3% worked in settings at high risk for COVID-19 exposure (e.g., ICUs, EDs, COVID-19 units). Overall, 43.7% reported a COVID-19 exposure and 91.3% were exposed at work. Just 3.8% in both high- and low-risk settings experienced COVID-19 illness. In regression analyses controlling for demographics, professional role, and work setting, the risk of COVID-19 illness was higher for Black/African-Americans (aOR 2.32, 99% CI 1.45, 3.70, $p < 0.01$) and Hispanic/Latinos (aOR 2.19, 99% CI 1.55, 3.08, $p < 0.01$) compared with Whites. Overall, 41% responded that they were experiencing job burnout. Responding about the day before they completed the survey, 53% of participants reported feeling tired a lot of the day, 51% stress, 41% trouble sleeping, 38% worry,

21% sadness, 19% physical pain, and 15% anger. On average, healthcare workers reported experiencing 2.4 of these 7 distress feelings a lot of the day.

CONCLUSIONS: Healthcare workers are at high risk for COVID-19 exposure, but rates of COVID-19 illness were low. The greater risk of COVID-19 infection among race/ethnicity minorities reported in the general population is also seen in healthcare workers. The HERO registry will continue to monitor changes in healthcare worker well-being during the pandemic.

TRIAL REGISTRATION: [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT04342806) identifier NCT04342806

KEY WORDS: COVID-19; SARS-CoV-2; healthcare worker; registry; disparities; burnout; well-being.

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INTRODUCTION

The 18 million people in the US healthcare workforce¹ are essential to the nation's pandemic response. Many are at risk for exposure to an infected person at work, and a substantial portion may experience severe illness if infected.² The pandemic has placed exceptional organizational and financial strain on healthcare institutions.^{3, 4} Physical and emotional symptoms due to the demands of the pandemic appear to be common among healthcare workers in international settings.^{5, 6}

Much of the evidence on the impact of the pandemic on healthcare workers, including infection rates, risk factors, and well-being, comes from international studies⁷ or US studies limited to single hospitals or health systems.^{8–10} We lack

Please see Appendix for list of HERO Registry Research Group collaborators.

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essential information about all healthcare workers' experiences with the pandemic, not just those infected with SARS-CoV-2 or those with direct patient care responsibilities. There also is a need for data from large-scale US studies to better describe how the pandemic is affecting US healthcare workers' personal and job-related well-being,¹¹ exposure and infection rates, and whether the racial and ethnic disparities in risk of SARS-CoV-2 infection seen in the general population¹²⁻¹⁵ are also present in US healthcare workers.

To begin filling these gaps, we launched the Healthcare Worker Exposure Response and Outcomes (HERO) research program (heroesresearch.org) in April 2020. Individual healthcare workers were invited to join the program by enrolling in a registry. Any adult who worked in a healthcare facility that delivered direct patient care was eligible to join. In this manuscript, we present initial results from the HERO registry enrollment survey of 14,600 healthcare workers who joined from April to July 2020. Our objectives are to describe in a national, convenience sample of healthcare workers the baseline characteristics of exposures to COVID-19; viral and antibody testing; physician diagnosis of COVID-19; job burnout; and, physical and emotional distress experiences. We contrast these experiences between personnel who work in settings at high risk for exposure (e.g., emergency departments and intensive care units) with those in lower risk settings.

METHODS

HERO Registry

Established in April 2020 with funding from the Patient-Centered Outcomes Research Institute, the HERO research program is one of the research activities of PCORnet®, the National Patient-Centered Clinical Research Network (pcornet.org).¹⁶ At its launch, the HERO research program included a registry (ClinicalTrials.gov Identifier NCT04342806), data from which this manuscript reports, and a clinical trial on prophylactic use of hydroxychloroquine (ClinicalTrials.gov Identifier NCT04334148). The clinical trial activated 40 recruitment sites, which were the primary sources of registry recruitment as well. All recruitment sites were part of or closely affiliated with academic medical centers.

Study procedures were reviewed by the Duke University School of Medicine Institutional Review Board and approved by the Western Institutional Review Board (Pro00105284). The registry defined a healthcare worker as anyone (e.g., clinicians, support staff, technicians, administrators, etc.) who works in a facility or organization that provides healthcare services to patients (e.g., hospitals, emergency medical services, clinics, skilled nursing facilities, first responders). Registry members had to be 18 years or older and able to read English. Within health systems participating in PCORnet,¹⁶ recruitment was done via advertisements, institution-wide emails, provider recommendations, and

newsletters. Additional approaches included articles in the media, social media advertisement, and professional society solicitations. Individuals accessed a website (heroesresearch.org) to join. None of these approaches was based on a denominator of eligible participants, as any adult healthcare worker in the nation was potentially eligible. Thus, we were unable to compute response rates for this cross-sectional survey.

Participants enrolled from April 10, 2020, to July 31, 2020. After electronically signing the consent form, they created a profile with contact information, demographics, employment characteristics, and interest in participating in future studies. The enrollment survey also contained questions about exposures, viral and antibody testing, COVID-19 illness history, symptoms, and job burnout.

Demographic and Work-Related Variables

Demographics included age, gender, race, ethnicity, and state of residence. We combined race and ethnicity into a single variable by assigning individuals to Hispanic/Latino if they endorsed this category in the ethnicity question; otherwise, we used their self-assigned race as Black/African-American, White, Asian/Pacific Islander, or Other. Participants indicated the type of healthcare facility where they were employed and their professional role. We used this information to construct a COVID-19 work setting exposure risk variable. High-risk settings included intensive care units, emergency departments/urgent care centers, COVID-19 therapeutic or diagnostic units, respiratory services, anesthesia, and emergency medical services. Individuals who reported that one of these settings was their primary place of work, regardless of their role, were assigned to the high-risk category; other settings were considered low risk.

COVID-19 Exposures, Testing, and Illness

We asked healthcare workers if they believed they had been exposed to an individual with COVID-19 illness, either at work or in their communities, and whether they had undergone viral or antibody testing, and if so, the result(s). Because access to viral testing was limited in the early months of the pandemic, we also asked if they had been diagnosed with COVID-19 without undergoing viral testing.

Job Burnout

We used a previously developed single item that has been shown to be a valid indicator of job burnout.¹⁷ Participants are instructed to define burnout for themselves: "Overall, based on your definition of burnout, how would you rate your level of burnout?" Responses are scored on a five-category ordinal scale, where 1 = "I enjoy my work. I have no symptoms of burnout"; 2 = "Occasionally I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out"; 3 = "I am definitely burning out and have one or more symptoms of burnout, such as physical and emotional

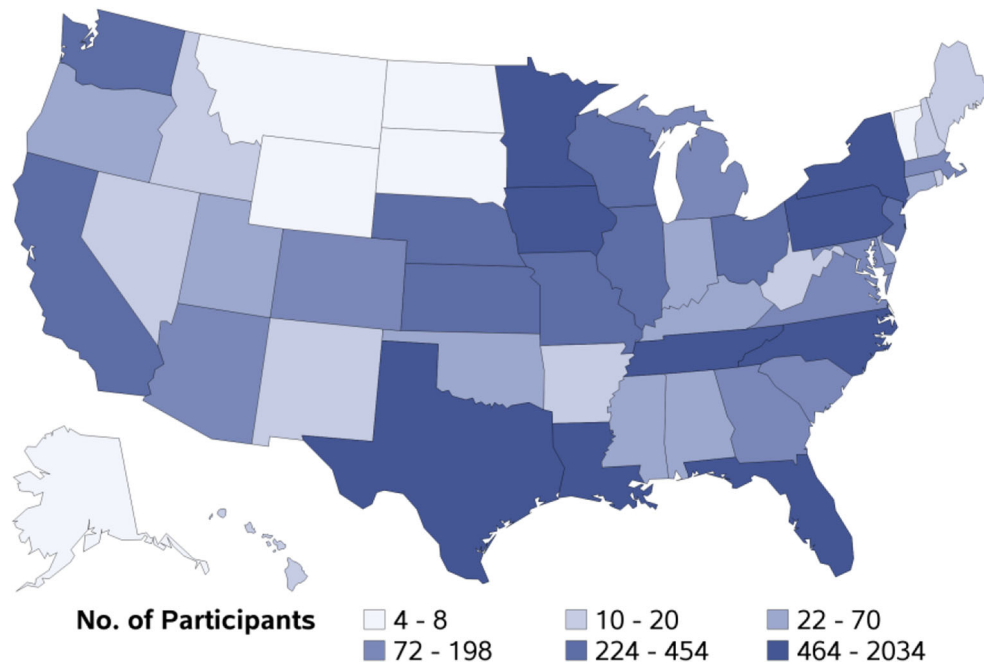


Figure 1 State of residence for 14,600 healthcare workers enrolled in the HERO registry. The map shows the count of healthcare workers who enrolled in the HERO research community via a web-based registry. Recruitment methods included communications done within healthcare systems that participate in PCORnet (pcornet.org), a national network-of-networks devoted to conducting clinical research; media articles and televised stories; social media; and professional societies. The count of the number of participants by state is based on individuals' recorded 5-digit zip codes of residence.

exhaustion"; 4 = "The symptoms of burnout that I'm experiencing won't go away. I think about frustration at work a lot"; and 5 = "I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help." Consistent with prior studies,^{17, 18} we dichotomized the item as ≤ 2 (no burnout) vs. ≥ 3 (job burnout).

Physical and Emotional Distress Experiences

We used a 1-day recall period to capture negative affective daily life experiences, which people have difficulty remembering accurately over longer periods of time.¹⁹ This approach is based on ecological momentary assessment, which samples individuals' experiences in near-real time to minimize recall bias and maximize ecological validity.²⁰ By using the phrase "a lot of the day," we added a high level of symptom severity to each item while maintaining the efficiency of a yes/no question. The questions we developed were based on a modification of the Gallup negative experiences index, which is used in the annual Global Well-Being report.²¹ Participants were asked about physical (trouble sleeping, pain, and fatigue) and emotional (worry, sadness, anger, and stress) distress experienced "yesterday." Each question used a yes/no response option. Except for the trouble sleeping item, which asked about last night, the other items were worded as "Did you feel [insert feeling] a lot of the day yesterday?"

Statistical Analyses

We used 5-digit zip code of residence to obtain a count of participants per state and then used those counts to create a national heat map of HERO participants. In bivariate analyses, we contrasted individuals whose work setting was high versus low risk for COVID-19 exposure; contrasts included demographics, type of facility where employed, professional role, COVID-19 testing and infection experiences, job burnout, and daily physical and emotional symptoms. We computed unadjusted proportions for viral testing or COVID-19 illness rates overall and by week of survey completion and race/ethnicity category. Statistical significance was evaluated using chi-squared tests for proportions and linear trends and *t* tests for means.

We fit three multivariable logistic regression models to explore associations for three outcomes: (1) COVID-19 infection (yes/no) as determined by a positive viral test, positive antibody test, or physician diagnosis; (2) job burnout (yes/no); and (3) count of the number of daily distress experiences. The first two regressions used a logit link and the third a Poisson link function. The explanatory variables included age, gender, race/ethnicity, type of healthcare facility where employed, job role, work setting risk for COVID-19 exposure, week of survey completion, and geographic region of residence. Results are reported as adjusted odds ratios (aORs) with 99% confidence limits for the

Table 1 Healthcare Worker Characteristics by the COVID-19 Exposure Risk of Their Work Setting

Characteristic	Work setting exposure risk*			p value
	Overall	High	Low	
	N = 14,600	N = 4423	N = 10,177	
Age, mean (SD), years	42.0 (11.5)	39.6 (10.7)	43.0 (11.6)	< 0.01
Age group, n (%), years				< 0.01
18–29	2114 (14.5)	813 (18.4)	1301 (12.8)	
30–49	8566 (58.7)	2729 (61.7)	5837 (57.4)	
50–64	3578 (24.5)	830 (18.8)	2748 (27.0)	
65+	342 (2.3)	51 (1.2)	291 (2.9)	
Female, n/%	11,149 (76.4)	3188 (72.1)	7961 (78.2)	< 0.01
Race/ethnicity, n (%)				0.04
Hispanic/Latino (any race)	1128 (7.7)	302 (6.8)	826 (8.1)	
Black/African-American	527 (3.6)	147 (3.3)	380 (3.7)	
White	11,523 (78.9)	3523 (79.7)	8000 (78.6)	
Asian/Pacific Islander	917 (6.3)	291 (6.6)	626 (6.2)	
Other (include other race, mixed)	505 (3.5)	160 (3.6)	345 (3.4)	
Type of healthcare facility, n (%)				< 0.01
Hospital	10,864 (74.4)	3876 (87.6)	6988 (68.7)	
Outpatient clinic/facility	1083 (7.4)	26 (0.6)	1057 (10.4)	
Skilled nursing facility	275 (1.9)	22 (0.5)	253 (2.5)	
Emergency services	242 (1.7)	200 (4.5)	42 (0.4)	
Other	2136 (14.6)	299 (6.8)	1837 (18.1)	
Professional role, n (%)				< 0.01
Clinical				
Nurse (RN/LPN)	4776 (33.2)	1939 (44.2)	2837 (28.4)	
Physician	2645 (18.4)	711 (16.2)	1934 (19.3)	
Physician-in-training	473 (3.3)	146 (3.3)	327 (3.3)	
Paramedic/emergency medical technician	412 (2.9)	409 (9.3)	3 (0.0)	
Physician's assistant (PA)	372 (2.6)	121 (2.8)	251 (2.5)	
Nurse practitioner (NP)	728 (5.1)	142 (3.2)	586 (5.9)	
Respiratory therapist	225 (1.6)	206 (4.7)	19 (0.2)	
Physical therapist (PT)	248 (1.7)	30 (0.7)	218 (2.2)	
Medical assistant	163 (1.1)	30 (0.7)	133 (1.3)	
Non-clinical				
Administrative staff	706 (4.9)	93 (2.1)	613 (6.1)	
Environmental services	78 (0.5)	17 (0.4)	61 (0.6)	
Laboratory technician	208 (1.4)	7 (0.2)	201 (2.0)	
Pharmacist/pharmacy technician	427 (3.0)	64 (1.5)	363 (3.6)	
Dietary/nutrition/food services	98 (0.7)	8 (0.2)	90 (0.9)	
Other	2,819 (19.6)	459 (10.5)	2,360 (23.6)	
Missing	222 (1.5)	41 (0.9)	181 (1.8)	

*High COVID-19 exposure risk work settings included intensive care units, emergency departments/urgent care centers, COVID-19 therapeutic or diagnostic units, respiratory services, anesthesia, and emergency medical services. All other settings were considered low risk

logistic regressions, and adjusted rate ratios (aRRs) with 99% confidence limits for the Poisson regression.

Analyses were done using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). *p* values are 2-sided tests and were considered statistically significant at < 0.01 because of the large sample size.

RESULTS

Study Sample

From April 10, 2020, to July 31, 2020, 14,600 healthcare workers joined the HERO registry, 8578 (58.8%) enrolled in April, 3769 (25.8%) in May, 1414 (9.7%) in June, and 839 (5.7%) in July. Individuals resided in all 50 states or the District of Columbia (Fig. 1). States with the largest numbers were Florida (*N* = 2034), New York (*N* = 1902), Pennsylvania (*N* = 1360), North Carolina (*N* = 1262), Tennessee (*N* = 1034), Minnesota (*N* = 960), Louisiana (*N* = 656), and Iowa (*N* = 607).

The mean participant age was 42.0 years, 76.4% were female, 78.9% were White, 74.4% worked in hospitals, and 33.2% were nurses (Table 1). High-risk settings were associated with younger workers and more males, hospital workers, and nurses compared with lower risk settings. Race/ethnicity did not differ by risk category. The professional roles reported were clinical (68.4%), non-clinical (10.5%), other (19.2%), and missing (1.5%).

Testing and COVID-19 Illness

Overall, 43.7% of healthcare workers reported exposure to someone with COVID-19, and 91.3% of those reported an exposure at work (Table 2). Healthcare workers in high-risk settings were twice as likely to report an exposure at work, while low-risk healthcare workers were twice as likely to report being exposed in community settings. Exposure risk did not vary by week of enrollment across the study period (*p* = 0.53, chi-squared test for linear trend).

Table 2 SARS-CoV-2 Exposures and Testing and COVID-19 Illness Among Healthcare Workers by the COVID-19 Exposure Risk of Their Work Setting

Characteristic	Work setting exposure risk			p value
	Overall	High	Low	
	N = 14,600	N = 4423	N = 10,177	
Exposure to SARS-CoV-2 virus, n (%)				
Any exposure	6379 (43.7)	2895 (65.5)	3484 (34.2)	< 0.01
Exposed at work place	5824 (39.9)	2817 (63.7)	3007 (29.5)	< 0.01
Exposed in community	807 (5.5)	163 (3.7)	644 (6.3)	< 0.01
Exposed at work place among those with any exposure	5824 (91.3)	2817 (97.3)	3007 (86.3)	< 0.01
SARS-CoV-2 viral test, n (%)				
Ever tested	2460 (16.8)	806 (18.2)	1654 (16.3)	< 0.01
Tested positive	268 (1.8)	88 (2.0)	180 (1.8)	0.36
Tested positive (among tested)	268 (10.9)	88 (10.9)	180 (10.9)	0.98
SARS-CoV-2 antibody test, n (%)				
Ever tested	1087 (7.4)	337 (7.6)	750 (7.4)	0.60
Tested positive	126 (0.9)	38 (0.9)	88 (0.9)	0.97
Tested positive (among tested)	126 (11.6)	38 (11.3)	88 (11.7)	0.83
Viral or antibody test positive, n (%)	354 (2.4)	113 (2.6)	241 (2.4)	0.50
Physician-diagnosed COVID-19 illness without a viral test, n (%)	235 (1.6)	62 (1.4)	173 (1.7)	0.19
SARS-CoV-2 viral or antibody test positive or physician diagnosis of COVID-19, n (%)	554 (3.8)	164 (3.7)	390 (3.8)	0.72

Despite their high rates of COVID-19 exposures, individuals in high-risk settings had similar rates of COVID-19 illness confirmed by viral testing, antibody testing, or diagnosis as those in low-risk settings. Among all healthcare workers, 2.4% had laboratory test evidence of SARS-CoV-2 infection (either viral or antibody test positive) and 3.8% had either a positive test or physician diagnosis.

Viral testing was reported by 16.8% of participants, and antibody testing by 7.4%. Among individuals who had a viral test, 10.9% had a positive result, and the test positivity rate did not differ by risk group. Similarly, among those who had an antibody test for SARS-CoV-2, 11.6% had a positive result with no difference between risk groups.

In logistic regression analyses in which COVID-19 illness was the outcome, there were no differences by age, sex, or work setting exposure risk (Table 3). The odds of COVID-19 illness was increased 2.32 times for Black/African-Americans and 2.19 times for Hispanic/Latinos compared with Whites. The odds of COVID-19 illness were reduced by 43% for individuals working in outpatient settings compared with those who worked in hospitals. Finally, the odds of infection increased by 4% each week during the study period.

Burnout

Overall, 41% of all healthcare workers responded that they were experiencing job burnout. In logistic regression analyses, job burnout was not associated with race/ethnicity, type of healthcare facility where employed, professional role, or week of survey administration (Table 3). Participants 50 years and older were less likely to report job burnout. The odds of reporting job burnout were 55% higher for females than for males, and 31% higher for those who worked in high- versus low-risk settings.

Distress Experiences

Responding about the day before they completed the survey, 53% of participants reported feeling tired a lot of the day, 51% stress, 41% trouble sleeping, 38% worry, 21% sadness, 19% physical pain, and 15% anger. On average, healthcare workers reported 2.4 of a total of these 7 distress feelings a lot of the day. In Poisson regression analyses, the count of the number of negative distress feelings experienced the prior day decreased with age and week of survey completion and was higher for females and those who worked in high-risk settings (Table 3).

DISCUSSION

In this study of healthcare workers during the early phase of the pandemic (April–July 2020), 43.7% reported exposure to someone with COVID-19 and 91.3% of those individuals were exposed at work. These high rates of exposure illustrate the safety risk that healthcare workers have faced in the conduct of their jobs. Despite high exposure rates, just 3.8% reported a positive viral or antibody test or a diagnosis of COVID-19, a proportion that is consistent with other studies.⁷ That just 1 in 10 healthcare workers exposed to the virus had evidence of COVID-19 is good news. However, the risk of COVID-19 illness was not similar across race/ethnicity groups. We found that Black/African-American and Hispanic/Latino healthcare workers were twice as likely to contract COVID-19 as Whites, even after controlling for other demographic characteristics, including geographic region of residence, features of the work environment, and professional role. This study does not explain the reasons for these disparities, but it does add support to other researchers' calls to

Table 3 Multivariable Regression Analyses for COVID-19 Illness, Job Burnout, and Daily Distress Experiences

Participant characteristic	Outcome*		
	COVID-19, aOR (99% CI)	Burnout, aOR (99% CI)	Distress experiences, aRR (99% CI)
Age, years			
18–29	Referent	Referent	Referent
30–49	1.26 (0.87, 1.81)	1.12 (0.88, 1.44)	<i>0.94</i> (0.89, 0.99)
50–64	1.38 (0.91, 2.08)	<i>0.68</i> (0.51, 0.90)	<i>0.80</i> (0.74, 0.85)
65+	1.13 (0.48, 2.64)	<i>0.44</i> (0.23, 0.81)	<i>0.66</i> (0.55, 0.80)
Gender			
Male	Referent	Referent	Referent
Female	0.96 (0.72, 1.29)	<i>1.55</i> (1.26, 1.91)	<i>1.40</i> (1.32, 1.50)
Race/ethnicity			
White	Referent	Referent	Referent
Black/African-American	2.32 (1.45, 3.70)	0.91 (0.53, 1.54)	0.89 (0.79, 1.01)
Hispanic/Latino	<i>2.19</i> (1.55, 3.08)	0.95 (0.69, 1.32)	1.02 (0.95, 1.10)
Asian/Pacific Islander	1.39 (0.91, 2.14)	0.86 (0.60, 1.23)	0.99 (0.90, 1.09)
Other	1.16 (0.62, 2.17)	1.07 (0.67, 1.69)	<i>1.13</i> (1.02, 1.26)
Type of healthcare facility			
Hospital	Referent	Referent	Referent
Outpatient clinic/facility	<i>0.57</i> (0.33, 0.99)	1.06 (0.74, 1.50)	0.95 (0.87, 1.04)
Skilled nursing facility	0.97 (0.41, 2.31)	2.05 (1.00, 4.22)	<i>1.25</i> (1.09, 1.43)
Emergency services	0.76 (0.25, 2.31)	0.68 (0.27, 1.70)	1.07 (0.89, 1.28)
Other	0.84 (0.58, 1.22)	0.92 (0.73, 1.16)	1.04 (0.98, 1.11)
Professional role			
Clinical			
Nurse	Referent	Referent	Referent
Physician	0.71 (0.49, 1.02)	0.79 (0.62, 1.00)	<i>0.80</i> (0.75, 0.86)
Physician-in-training	0.77 (0.40, 1.48)	0.68 (0.42, 1.09)	<i>0.83</i> (0.73, 0.95)
Paramedic/EMT	0.67 (0.24, 1.81)	0.92 (0.52, 1.64)	0.97 (0.83, 1.12)
Physician's assistant	0.96 (0.48, 1.90)	0.97 (0.60, 1.57)	0.82 (0.72, 0.94)
Nurse practitioner	1.18 (0.69, 2.01)	0.85 (0.60, 1.21)	0.99 (0.91, 1.09)
Respiratory therapist	0.95 (0.36, 2.51)	0.65 (0.32, 1.30)	0.97 (0.82, 1.14)
Physical therapist	1.42 (0.67, 2.99)	0.96 (0.55, 1.70)	0.91 (0.78, 1.07)
Medical assistant	1.27 (0.46, 3.45)	1.50 (0.56, 4.01)	1.07 (0.89, 1.28)
Non-clinical			
Administrative staff	1.01 (0.61, 1.66)	0.92 (0.61, 1.38)	1.05 (0.96, 1.16)
Environmental services	n/a	1.53 (0.38, 6.19)	1.10 (0.82, 1.46)
Laboratory technician	0.54 (0.16, 1.79)	1.55 (0.80, 3.01)	1.03 (0.86, 1.22)
Pharmacist	<i>0.29</i> (0.09, 0.97)	1.20 (0.74, 1.95)	0.91 (0.80, 1.03)
Dietary/food services	0.71 (0.18, 2.78)	1.15 (0.39, 3.39)	0.92 (0.71, 1.19)
Other	0.80 (0.58, 1.11)	0.91 (0.72, 1.14)	0.95 (0.89, 1.00)
Work setting risk			
Low	Referent	Referent	Referent
High	0.95 (0.72, 1.25)	<i>1.31</i> (1.08, 1.58)	<i>1.08</i> (1.03, 1.13)
Week of survey completion	<i>1.04</i> (1.01, 1.07)	1.01 (0.95, 1.07)	<i>0.98</i> (0.97, 0.99)

*The regression models controlled for type of healthcare facility where employed and geographic region of residence. Logistic regression was used for the COVID-19 illness and burnout outcomes, and Poisson regression for the distress experiences outcome. Italicized parameter estimates are significantly different from the referent at $p < 0.01$. There were no cases of COVID-19 among environmental services workers

further examine and address COVID-19 race/ethnicity disparities.^{12–15}

This study relied on self-reported data for exposures and testing results, which can be affected by recall bias. Nonetheless, it is likely that healthcare workers have excellent knowledge of their testing history, the meaning of these tests, and good recall because of the profound impact of COVID-19. An important limitation of this study's external validity was the study sample selection. Although drawn from all 50 states and the District of Columbia, the sample was composed of volunteers who registered to be part of the HERO registry and should be considered a convenience sample. Participants were largely but not entirely recruited from within academic medical centers that participate in PCORnet. Figure 1 shows the national distribution of participants, but the sample cannot be considered nationally representative. Still, the study sample

had demographic characteristics similar to an April 2020 CDC report of over 9000 healthcare workers infected with COVID-19: median age was 42 years in both samples, 76% were female (vs 73% CDC sample), and 79% (vs 73%) were White.²² This is also similar to the data from the US Census Bureau, which identified women holding 76% of health care jobs.²³

We found that 40.9% of our sample reported job burnout. In a 2015 study, the same measure was distributed to physicians, nurses, clinical associates, and administrative clerks—a diverse group of clinical and non-clinical healthcare workers similar to the sample in our study—in the Veterans Health Administration (VA), and investigators reported a job burnout rate of 38.5%.¹⁷ The similarity between our findings during the pandemic and those from the VA before the pandemic is striking. The HERO research program will continue to

monitor job burnout to determine whether the pandemic has an impact on this important outcome over time.

Although the proportion of healthcare workers experiencing distress was high, the levels are not dissimilar from the US population. We contrasted the 2018 Gallup Emotions Survey²¹ with our results. This contrast showed that the HERO registry sample had lower or the same proportions of pain, worry, sadness, stress, and anger as the US general population. This similarity reflects the resiliency of healthcare workers: despite the challenges and burdens of the pandemic, their distress experiences were comparable to the general population. Indeed, the level of distress decreased during the study period, which provides further evidence of the adaptive capacity of the healthcare workforce.

Our results suggest that additional research is needed to better understand how the pandemic is uniquely affecting female healthcare workers. After controlling for demographic and work characteristics, women were more likely than men to report job burnout and distress experiences. Our results do not reveal the origins of these differences or their consequences. The HERO research program is uniquely positioned to better understand changes in distress experiences over time and to conduct sub-studies that may illuminate causes for the gender-based differences, such as work-life balance.

This manuscript provides a broad description of the COVID-19 experiences and impact on US healthcare workers during the early phase of the pandemic (April–July 2020). It is a 4-month snapshot. The HERO program continues to enroll healthcare workers in its registry and intends to offer a variety of new studies to members. The registry can be used to monitor the impact of the pandemic over time and to better understand the differential impact it may be having on sub-populations, such as ethnic minorities and women.

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Compliance with Ethical Standards:

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