Original Article

Assessment of Healthcare Professionals' Wellbeing During a Peak of the COVID-19 Pandemic in a Healthcare System in Ohio

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Abstract

Objective: The purpose of this cross-sectional study was to evaluate multiple indices of wellbeing in healthcare professionals during the COVID-19 pandemic.
Methods: Healthcare professionals were invited to participate across the University Hospitals healthcare system in Ohio, USA. Participants (N = 6397) completed online questionnaires on their wellbeing, including healthy behaviors, safety and security, mental and physical health concerns, and social support. Differences in wellbeing across demographics were also assessed.
Results: Overall, healthcare professionals' mean subjective wellbeing was 7.98 (1.50) and their future health score was 3.98 (1.13). Room for improvement was noted for diet, sleep, and positive thinking. Males reported significantly higher levels of overall wellbeing and future health scores, including fruit and vegetable intake and physical activity, and alcohol use, whereas females reported higher levels of positive thinking and tobacco use. Of the three largest racial groups, White and Asian employees scored significantly higher on future health, *M* = 4.00 (1.17) and *M* = 4.10 (1.13), than Black or African American employees, *M* = 3.74 (1.10).
Conclusions: This cross-sectional study assessed the wellbeing of healthcare workers during the initial peak of the COVID-19 pandemic prior to vaccine delivery. Future work will implement strategies to improve healthcare workers' wellbeing in an individualized way based on our findings, as well as evaluate changes in wellbeing and future health scores across time.

Keywords

wellbeing, healthcare workers, healthy behaviors, diet, pandemic

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Introduction

Healthcare professionals often experience work related stress and burnout, which can compromise their overall wellbeing and put them at risk for several negative health outcomes, including increased disease and mortality.[1,2] Furthermore, healthcare professionals' stress also impacts the quality of patient care,[3] compromising professionalism and the healthcare system as whole.[4-6] In order identify strategies and interventions to improve healthcare professionals' wellbeing, it is necessary to measure various aspects of their health and health-related behaviors at baseline.

The COVID-19 pandemic has presented unprecedented challenges for the healthcare system and has considerably impacted the wellbeing of healthcare professionals globally.[7-10] A meta-analysis of 206 studies across the globe

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revealed anxiety, depression, PTSD to be increased in healthcare professionals due to the pandemic, highlighting an urgent public health issue.[11] For example, a systematic review and meta-analysis found that mood and sleep disturbances were prominent in healthcare workers in China and Singapore.[12] Healthcare workers' stress, hypervigilance, fatigue, sleeping difficulty, fear, difficulty concentrating, unhappiness, and self-doubt were significantly increased in Belgium.[7] In the UK and USA, healthcare professionals reported moderate to severe levels of depression and anxiety,[8,13] and disturbed sleep and increased alcohol use.[14] A national cross-sectional survey of healthcare workers in the U.S. found that 61% reported fear of exposure or transmission, 38% reported anxiety/depression, 43% suffered work overload, and 49% had reported burnout. Stress scores were highest among nursing assistants, medical assistants, and social workers, inpatient workers, women, and in Black and Latino/Latina workers (small ESs, $P < .001$).[15] Main determining factors of reduced wellbeing include direct patient contact as a frontline healthcare worker (e.g., nurse), being redeployed to a different job,[8,9] and fear of coronavirus.[16]

Individual resilience, maintaining psychological health in times of stress, is critical for mitigating the negative impact on health. One study found that resilience reduced the effect of coronavirus fear on depression, anxiety, and stress in healthcare professionals working with COVID-19 patients.[16] Healthy behaviors, including exercise, healthy eating, sleep, as well as healthy mindsets, such as mindfulness and positive thinking, are key contributors to psychological resilience.[17-19] Unfortunately, stress can reduce these healthy behaviors, thereby lessening the resilience needed to ease or prevent the damage of stress.[20] Evidence suggests that healthy behaviors, such as healthy eating, sleep, and exercise were negatively impacted by the pandemic.[16,20-22] Likewise, increases in healthy behaviors can act as a protective factor for healthcare professionals' wellbeing during the pandemic. For example, Canadians who were physically active during the pandemic had more favorable wellbeing outcomes compared to those who were less active.[21]

The purpose of the current cross-sectional study was to evaluate aspects of wellbeing in a large sample of healthcare employees in a major healthcare system in Ohio, USA. The timing of the study, during the fourth quarter of 2020 (Oct–Dec), happened to coincide with the COVID-19 pandemic surge and prior to vaccine delivery. Thus, this study represents an assessment of healthcare employee wellbeing during the pandemic. Primary outcomes of interest included in the evaluation were overall wellbeing and future health (i.e., healthy behaviors), and secondary outcomes of interest include job fulfillment, perceptions of safety and security, health concerns and perceived social support.

Methods

Setting and Participants

UH is a non-profit health care system in Northeast Ohio with 18 hospitals and approximately 28,000 caregivers, 4% of whom reside in rural settings and many of whom are at risk of adverse social determinants of health. UH is largely a female driven entity. As of August 2021, 65% percent of UH employees are female, about 27% are non-white, and 14% are not college educated. This study was a quality improvement study with healthcare workers and as such, did not require ethics approval by the University Hospitals Institutional Review Board.

Patient and Public Involvement

Members of the University Hospitals Human Resources provided input as the proxy for employee participation in the project design. We carefully assessed the burden of the survey on employees. We intend to disseminate the main results to the participants and will seek employee involvement in the development of an appropriate method of dissemination.

Procedure

During the fourth quarter of 2020 (Oct–Dec), all 27,660 healthcare professionals were able to participate in the survey through the UH employee benefits website, HealthyUH. Healthcare professionals were primarily informed about the survey within the HealthyUH platform, but they may have also heard about the survey through email notifications or word-of-mouth. There were 10,105 unique employee logins during the period of the study, 36% of the total employee population. Of the employees that logged into the platform, 6397 completed the survey (63%) and received 50 UH points, which translates to $50 remuneration via payroll.

Questionnaires

Wellbeing. The Wellbeing Index is a measure of health and wellbeing for adults developed by HealthPartners, a health plan based in Minnesota.[22] The Wellbeing Index is composed of three scores: a wellbeing score, a current health score, and a future health score. Based on the data available, we only assessed the wellbeing score and future health score for the current study.

The *wellbeing score* is a single item, *how satisfied are you with your life?* answered on a scale from 0 (Not at all) to 10 (Extremely). The authors arbitrarily defining a response of 9 or 10 as a high level of wellbeing, a response of 7 or 8 as a moderate level of wellbeing, and a response of 0 to 6 as a low level of wellbeing.[22]

The *future health score* is comprised of questions related to healthy behaviors, including positive thinking (i.e., thinking of

good things that have happened), physical activity (i.e., hours of exercise), sleep (i.e., number of hours per night), diet (i.e., fruit and vegetable intake), tobacco, and alcohol use. For each healthy behavior, a pass is coded as 1 and a fail is coded as 0, with total future health scores ranging from 0 to 6 (0 to 7 in Kottke and colleagues[22]). An additional measure not included in this study is the preventive care metric, as it involved accessing participant's health data.

Job fulfillment Participant's job fulfillment was measured by a single item: *in general, how enjoyable and fulfilling is your main job or daily work?* measured on a Likert scale from 0 (not at all) to 10 (extremely).

Safety and Security

Perceptions of security and safety were measured for food security fears/scarcity, financial security, and perceived safety in one's neighborhood. For food related security, participants were asked to rate the following statements on a Likert scale from 0 (never true) to 6 (always true): 1) *we worried whether our food would run out before we got money to buy more* and 2) *the food we bought just didn't last, and we didn't have money to get more*.

For financial security, participants were asked on a scale from 0 (not at all) to 10 (extremely): *how well are you able to manage your finances so that you feel in control of your financial situation?*

For neighborhood safety, participants were asked *how safe do you feel in your neighborhood?* and answered on a Likert scale from 0 (not at all) to 10 (extremely).

Health Concerns and Social Support

For health concerns, participants were asked 1) *how much do emotional health concerns, such as feeling depressed or anxious, get in the way of your life?* and 2) *how much do physical health concerns get in the way of your life?* on a categorical scale from not at all to completely.

Social support was measured by one item, *when you need advice or support, is there someone you can turn to?* Respondents answer either yes, no, or I don't know.

Data Analysis

Demographic data were analyzed by frequency (sex, race, ethnicity, education) or by mean and standard deviation (age). Means and standard deviations were computed for continuous variables and frequencies were computed for categorical variables. Demographic differences in continuous variables were analyzed via one way analysis of variance (ANOVA) with least-squared difference (LSD) were performed for post hoc comparisons between groups. Categorical variables (pass or fail; demographics) were analyzed with chi square tests.

Table 1. Demographics of the Sample (N = 6397).

Demographic Variable	N	%
Age[a]		
<20 Years of age	3	0
20–30 Years of age	590	9.2
30–40 Years of age	1277	20.0
40–55 Years of age	1557	24.3
55–60 Years of age	519	8.1
60–65 Years of age	445	7.0
65+ Years of age	214	3.3
Not available	1792	28.0
Sex		
Female	4601	71.9
Male	1758	27.5
Other	10	0.2
No answer	28	0.4
Race		
White	5307	83.0
Black or African American	480	7.5
Asian	211	3.3
American Indian or Alaskan Native	8	0.1
Native Hawaiian or Pacific Islander	6	0.1
Other	128	2.0
Multiracial	182	2.8
No answer	75	1.2
Ethnicity		
Not Hispanic or Latino	5973	93.4
Hispanic or Latino	185	2.9
No answer	239	3.7
Education		
8th grade or less	5	0.1
Some high school	14	0.2
High school diploma or GED	475	7.4
Some college	856	13.4
Technical training or Associate degree	935	14.6
College degree	2367	37.0
Graduate studies	1735	27.0
Not reported	10	0.2
Occupation[a]		
Administrative support	1261	19.7
Clinician	1527	23.9
Executive	23	0.4
Management	621	9.7
Resident clinician	144	2.3
Student	5	0.1
Technician	866	13.5
Not available	1792	28.0

[a]*De-identified data were obtained from employment records.*

Results

Demographics

The demographics of the sample, including age, sex, race, ethnicity, education, and occupation are displayed in Table 1.

Table 2. Wellbeing Index Scores by Gender and Total.

	Mean (SD)			
Variable	Total	Female	Male	p
Overall wellbeing	7.98 (1.50)	7.86 (1.53)	8.21 (1.43)	.001
Future health score	3.98 (1.16)	3.51 (.99)	4.86 (.93)	.001
Future health score items	*% Passed*			
	Total	*Female*	*Male*	
Fruit and veg intake	34.7	34.1	36.5	.023
Positive thinking	47.7	49.8	42.5	.001
Physical activity	66.3	63.6	73.9	.001
Sleep	60.2	59.8	61.3	.438
Alcohol use	92.5	91.4	95.5	.001
Tobacco use	97.6	98.1	96.3	.001

Note. Overall wellbeing and total future health scores between genders were analyzed via ANOVA and future health score items were analyzed via chi squared tests.

Table 3. Wellbeing Index Scores by Age Range.

	Overall Wellbeing		Future Health Score		
Age Range	M	SD	M	SD	*N*
<20 years old	9.33	.58	4.67	.58	3
20–30 years old	7.84	1.52	3.85	1.06	588
30–40 years old	7.94	1.47	3.95	1.17	1263
40–55 years old	7.81	1.50	3.91	1.18	1542
55–60 years old	7.98	1.43	3.97	1.12	512
60–65 years old	8.01	1.51	4.06	1.15	440
65+ years old	8.26	1.41	4.19	1.14	211
Not reported	8.16	1.53	4.06	1.18	1765

Note. Overall wellbeing and total future health scores were analyzed via ANOVA.

Wellbeing Index

Mean and standard deviations of the wellbeing score and future health score for the total sample and by sex are displayed in Table 2. We found that 37.8% of employee's scores were in the high level of wellbeing (scores of 9 and 10), 48.0% were in the moderate level of wellbeing (scores of 7 and 8) and 13.6% were in the low level of wellbeing (scores of 0 to 6).[22]

Females and males significantly differed on overall wellbeing, F (4, 5927) = 17.42, P < .001; future health scores, F (4, 5997) = 2.56, P = .037; and all of its components: fruit and vegetable intake, X^2 (4, 5997) = 10.46, P =.033; positive thinking X^2 (4, 5997) = 28.28, P <.001; physical activity, X^2 (4, 5997) = 64.91, P < .001; alcohol, X^2 (4, 5997) = 33.78, P < .001; and tobacco use, X^2 (4, 5997) = 20.88, P < .001, except for sleep (Table 2).

Scores from the Wellbeing Index across age ranges is shown in Table 3. There was a significant overall difference across ages for both overall wellbeing, F (7, 6323) = 8.23, P < .001, and future health scores, F (7, 6396) = 4.69, P < .001. Pairwise least-squared difference comparisons revealed significantly higher wellbeing and future health scores for those over 65 years of age compared to every other age group (P < .05).

Race and Ethnicity Differences in Wellbeing

The means and standard deviations across races with a sample size of n = 200 or more are represented in Table 4. There were no significant differences between white, Black or African American, or Asian employees for wellbeing score, F (2, 5927) = 2.32, P = .099. However, there were significant differences between races for future health score, F (2, 5997) = 13.65, P < .001, with Asian and White employees scoring significantly higher than Black or African American employees (P < .001). There were significant differences for all individual future health score variables (except for tobacco use): fruit and vegetable intake, X^2 (2, 5760) = 17.64, P <.001, positive thinking, X^2 (2, 5761) = 26.06, P <.001, exercise, X^2 (2, 5787) = 45.63, P <.001, P < .001, sleep, X^2 (2, 5759) = 31.50, P < .001; and alcohol use, X^2 (2, 5979) = 16.66, P <.001 (See Table 4). Of note, Black or African American participants reported the numerically highest score on positive thinking construct, but the lowest score on fruit/veg intake, exercise, sleep, and alcohol use. In contrast, Asians reported the highest score on fruit/veg intake, exercise, sleep, and alcohol use, and the lowest score on positive thinking. Asians and Black or African Americans significantly differed on every future health variable, Black or African Americans and Whites significantly

Table 4. Mean and Standard Deviations for Wellbeing and Future Health Scores and Future Health Score Items, Grouped by Race and Ethnicity.

Race	Wellbeing		Future Health		Fruit/Veg	Pos. Thinking	Exercise	Sleep	Alcohol	Tobacco
	M	*SD*	*M*	*SD*	% pass	% pass	% pass	% pass	% pass	% pass
White	7.99	1.50	4.00	1.17	35.0	46.8	67.7	61.2	92.4	97.4
Black or African American	7.84	1.66	3.72	1.10	25.5	59.0	52.5	48.0	90.2	98.5
Asian	8.01	1.59	4.10	1.13	38.9	43.6	68.2	61.4	99.1	99.5
Multiracial	7.96	1.45	4.01	1.17	34.5	47.8	63.7	63.7	94.0	97.3
Ethnicity										
Not Hispanic or Latino	7.97	1.50	3.98	1.16	34.5	47.5	66.3	60.3	92.5	97.6
Hispanic or Latino	8.11	1.56	3.90	1.13	33.5	49.2	65.9	54.6	90.3	97.3

Note. Only races represented by a sample size of n = 200 or more were included.

Table 5. Wellbeing Index Scores for Different Healthcare Occupations.

Occupation	Wellbeing		Future Health		Fruit/Veg	Pos. Thinking	Exercise	Sleep	Alcohol	Tobacco
	M	*SD*	*M*	*SD*	% pass	% pass	% pass	% pass	% pass	% pass
Administrative support	7.80	1.54	3.81	1.14	27.6	47.4	59.3	59.0	91.0	97.9
Clinician	8.00	1.37	4.09	1.16	37.8	51.6	68.4	59.8	92.9	99.1
Executive	8.43	1.12	4.35	1.23	43.5	69.6	69.6	56.5	95.7	100
Management	7.99	1.39	4.05	1.11	34.1	46.5	69.6	62.3	94.5	98.7
Resident clinician	7.98	1.40	3.83	1.06	31.0	31.9	66.0	57.0	98.6	100
Technician	7.78	1.69	3.77	1.17	29.0	45.4	62.1	55.3	89.4	97.1
Therapist	8.30	1.32	4.34	1.05	46.2	54.5	74.7	65.6	95.6	98.7

Note. The student category is not included in the table due to small sample size (n = 5).

differed on every variable except alcohol and tobacco intake, and Asian and Whites significantly differed only on tobacco use (all ps < .05).

Hispanic healthcare workers and non-Hispanic healthcare workers did not significantly differ on any variable (Table 4).

Healthcare Occupation

The Wellbeing Index scores across occupation type are displayed in Table 5. There were significant overall differences in wellbeing, F (8, 5927) = 18.91, P <.001, and future health scores, F (8, 5997) = 12.61, P <.001 (see Table 5). Executives had the highest wellbeing and future health scores, followed by therapists, and clinicians. Lowest wellbeing and future health scores were observed for technicians and administrative support workers. There were significant differences in wellbeing between the lower scoring technicians and administrative support workers and the higher scoring therapists (P <.001), executives (P = .026; P = .036), management (P < .001; P = .006), and clinicians (P < .001). These same between group differences were also observed for future health scores, with the addition of resident clinicians also scoring significantly lower on future health compared to therapists (P < .001), executives (P = .045), management (P = .039), and clinicians (P = .011).

Job Fulfillment

Mean overall score on the job enjoyment/fulfillment question was 7.00 (2.01) out of 10. There was a significant difference between gender, F (1, 6307) = 18.09, P < .01; whereby males, M = 7.22 (SD = 1.98), reported greater job fulfillment than females, M = 6.91 (SD = 2.02). There were significant differences between races, F (2, 5912) = 14.81, P < .001, with Asians reporting highest job fulfillment, M = 7.43, SD = 1.91, followed by White, M = 7.02, SD = 1.96, and Black or African American, M = 6.60, SD = 2.30, with each race significantly different from each other (all ps < .01). There was also a significant difference in job fulfillment across occupation, F (8, 6306) = 4.05, P < .001, with Executives (M = 8.43, SD = 1.24) scoring higher than every other occupation type (all ps < .05) (see Table 6).

Security and Safety

When asked if they worried their food would run out before they could buy more, 88% of participants responded, “never true,” 2% “often true,” and 10% “sometimes true.” With respect to food not lasting and being unable to buy more food,

Table 6. Means (M) and Standard Deviations (SD) for Job Fulfillment Scores.

	Job Fulfillment	
Occupation	*M*	*SD*
Administrative support	6.85	2.12
Clinician	7.05	1.88
Executive	8.43	1.24
Management	7.17	1.83
Resident clinician	7.13	1.65
Student	6.40	1.95
Technician	6.86	2.13
Therapist	7.26	1.79
Total	7.00	2.01

90% responded that was "never true," 1% "often true," and 9% "sometimes true." There was a statistically significant difference between gender, X^2 (12, 6304) = 57.10, $P < .001$, whereby women reported being more concerned about food security.

In their ability to manage their finances, participants reported a mean of $M = 8.08$ ($SD = 1.92$). There was a significant difference between gender, F (4, 6356) = 17.12, $P < .001$, with males, $M = 8.40$ ($SD = 1.69$), rating their ability higher than females, $M = 7.96$ ($SD = 1.98$). There was also a significant difference between races, F (4, 6093) = 16.93, $P < .001$, whereby Asians reported the highest score, $M = 8.32$, $SD = 1.82$, followed by Whites, $M = 8.13$, $SD = 1.88$, and Black or African Americans, $M = 7.42$, $SD = 2.16$.

With regards to neighborhood safety, participants reported an overall mean of 8.89 ($SD = 1.40$). There was a significant difference between gender, F (4, 6370) = 12.81, $P < .001$, with males $M = 9.07$ ($SD = 1.27$) reporting feeling safer than females $M = 8.82$ ($SD = 1.43$).

There was also a significant difference between races, F (4, 6109) = 60.60, $P < .001$, whereby White employees reported the highest score, $M = 8.99$, $SD = 1.30$, followed by Asians, $M = 8.50$, $SD = 1.62$, and Black or African Americans, $M = 8.02$, $SD = 1.79$.

Health Concerns and Social Support

When asked whether emotional concerns get in the way of life, 31.8% reported "not at all," 39.2% "a little bit," 20.1% "some," 8.0% "quite a bit," and .6% "completely." There was a statistically significant difference between gender for emotional concerns, X^2 (20, 6397) = 170.12, $P < .001$, whereby females reported higher emotional concerns than males.

With respect to physical concerns getting in the way of life, 40% reported "not at all," 36.5% "a little bit," 17.1% "some," 5.4% "quite a bit," and .5% "completely. There was a statistically significant difference between gender for physical concerns, X^2 (20, 6397) = 59.74, $P < .001$, whereby males reported more physical concerns than females.

Overall, 92.3% of participants responded yes to having social support, 3.4% responded no, and 3.4% did not know. There was a statistically significant difference between gender, X^2 (12, 6397) = 48.61, $P < .001$, whereby males reported less certain of their social support compared to females.

Discussion

The current study was a cross-sectional survey of healthcare workers obtained during the fourth quarter of 2020 (during a peak of the COVID-19 pandemic), prior to healthcare workers being able to receive a vaccine. As such, it provides some insights into how healthcare workers self-reported their subjective wellbeing.

Overall, healthcare professionals' mean subjective wellbeing was rated 7.98 (1.50) and their future health score 3.98 (1.16). While healthcare workers' overall wellbeing and healthy behaviors appear to be healthy, there is still room for improvement. The greatest opportunity for improvement in the future health score was identified as workers being able to increase fruit and vegetable intake, improving sleep, and increase positive thinking, specifically, think about the good things that have happened to them.

There were significant demographic and occupational differences in wellbeing and health scores uncovered in the current study. Between the sexes, males reported higher levels of overall wellbeing and future health scores, including fruit and vegetable intake and physical activity, but higher levels of alcohol use, whereas females reported higher levels of positive thinking and tobacco use. These findings are consistent with previous literature on sex differences and healthy behaviors,[23] with the exception of higher fruit and vegetable intake reported by men[23-25] and higher tobacco use by women,[23,24,26] as the opposite is often the case. There are many socioeconomical, psychosocial, environmental, and cultural differences that determine wellbeing and healthy behaviors. Further work will examine these differences in more detail, with exploration of covariates such as occupation and income. Programming and resources that target female employees will also be considered as a strategy to increase wellbeing and healthy behaviors in this group.

With race, Black or African American participants and Asians showed reverse relationship with healthy behaviors from the future health score. Whereas Black or African Americans reported the highest score on positive thinking, but the lowest score on fruit/veg intake, exercise, sleep, and alcohol use; Asians reported the highest score on fruit/veg intake, exercise, sleep, and alcohol use, and the lowest score on positive thinking. White healthcare workers also reported significantly higher scores than Black or African Americans on every health variable except alcohol and tobacco intake. Some research has found that during the pandemic in the United States, African Americans were more likely to

increase their unhealthy eating, alcohol, and tobacco use whereas Asian Americans were less likely to increase these unhealthy behaviors.[27] These demographic findings will help guide appropriate programming to build resilience to workplace stress in an individualized way, in alignment with the principles of integrative medicine.

Healthcare worker occupation type was associated with differences in both overall wellbeing and future health scores, with executives and therapists reported highest scores, and those with administrative and technical occupations the lowest scores. Likewise, these differences were also reflected in employees' rated job fulfillment. While we did not collect income data, our future work will also include income as a covariate for exploring potential differences in wellbeing and future health scores. Previous research has also shown differences in wellbeing as well as disparities in the negative impact of the COVID-19 pandemic on different healthcare worker populations.[8,9,12] Therefore, the information from the current study may be useful for healthcare systems to determine strategies and deliver interventions to improve wellbeing for specific populations of the healthcare workforce.

The results from the current study are comparable to findings from a previous study using the same wellbeing index in a large sample of healthcare plan members (N = 754,584).[22] Specifically, both populations reported a moderate level of subjective wellbeing (7.98 vs 8.02). Unlike the differences between the sexes found in the current study, with men scoring higher on wellbeing than women, Kottke and colleagues[22] did not observe any sex differences. Moreover, Kottke and colleagues' study[22] did not find differences in wellbeing or future health across different races. However, both studies did observe higher wellbeing scores associated with increased education. The differences observed across these two studies could be attributable to differences between the two populations (healthcare workers vs healthcare plan members) and point to the need for more research. With respect to the future health score, comparisons cannot be easily made, as we were unable to obtain participants use of preventive services.

There are several limitations of the current study that warrant discussion. First, as a cross-sectional study, we had no ability to compare the results of this study with prior years, restricting our ability to attribute wellbeing scores to the strain of the pandemic. Second, there could be a response bias, whereby those who took the survey had more time and/or were less stressed or impacted by the pandemic than those who did not take the survey. Some of our previous research has shown that those who report higher stress levels are less likely to complete post and follow-up surveys.[28,29] Third, while we noted demographic differences across races, they may not reflect the entire healthcare worker population. For example, 19% of the entire UH healthcare employee population is Black or African American, whereas only 7.5% of employees that took the survey were Black or African American, potentially biasing the results. To mitigate these limitations in future work, strategies to recruit a larger proportion of the sample that is more reflective of the total demographic will be employed, such as ensuring that all employees are made aware of the survey. Furthermore, while there was incentive for participating ($50), we will consider additional incentives, such as lotteries or prize packs.

We recognize that self-report data may result in biased reporting, and we acknowledge that as another study limitation. However, subjective rating is imperative for subjective experience, such as one's satisfaction with life, for example. While the Wellbeing Index is a new measure that has not been used much previously, limiting our ability to compare outcomes with other populations. Our justification for using the Well-Being Index was its brevity as well as it's applicability to an Accountable Care Population of which the UH healthcare workers are members through the UH health plan. Lastly, we were unable to include data on insurance claims, thereby limiting the full scope related to the Wellbeing Index. To address these limitations, subsequent studies will also make use of insurance claims data to complete the data set and determine future health as well as current health scores. Importantly, longitudinal data will also be obtained for evaluating changes overtime, post-pandemic, as well as post-intervention.

Conclusions

Healthcare professionals' wellbeing is important for numerous reasons, including for their own physical and mental health, as well as quality of the care that they deliver to patients. The COVID-19 pandemic has resulted in considerable levels of stress and reduced wellbeing in healthcare professionals globally. While healthcare workers' wellbeing remained largely positive in Ohio, there is room for improvement with increasing consumption of fruits and vegetables, positive thinking, and improving sleep. The demographic and occupational differences in wellbeing and health will help guide individualized programming for different groups of healthcare workers. For example, targeted support for improving wellbeing and healthy behaviors for women, African Americans, and technicians and administrative support workers should be prioritized. Future work will compare these results with a proposed 2021 survey, to assess whether there are changes in scores and to identify further areas of improvement.

Author Contribution

Study planning was done by JD and FA, the study was conducted and the data was collected by TB, data analysis was performed by ND and TB, and ND, JD, TB, and FA wrote the manuscript.

Declaration of conflicting interests

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