Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

American Journal of Infection Control 000 (2022) 1–8

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Associations among infection prevention professionals' mental/physical health, lifestyle behaviors, shift length, race, and workplace wellness support during COVID-19

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Key Words:
Mental health
Infection control
Life style

A B S T R A C T

Background: COVID-19 added stress to infection prevention professionals' (IPs) work-life that may have impacted their well-being. This study aimed to describe IPs' mental and physical health and lifestyle behaviors during the pandemic and their associations with IP role, perceived worksite wellness support, shift length, and race and/or ethnicity.

Methods: A random sample of Association for Professionals in Infection Control and Epidemiology members (6,000) were emailed a survey assessing mental and physical well-being, lifestyle behaviors, and perceived worksite wellness support.

Results: A total of 926 IPs responded (15% response rate). Few met guidelines for sleep (34.1%), physical activity (18.8%), and fruit and vegetable consumption (7.3%). Rates of depression, anxiety, and burnout were 21.5%, 29.8%, and 65%. Front line and practicing IPs and IP administrators and directors had more negative mental health impacts than IPs in other roles. IPs with organizational wellness support were less likely to report negative COVID-19 impacts. IPs working 9-11+ hours/day were more likely to report worsening physical and mental health due to COVID-19. There were no significant differences in odds of negative COVID-19 impacts on lifestyle behaviors between white and racial and ethnically diverse IPs.

Conclusions: IPs who worked shorter shifts and had more organizational wellness support had better well-being outcomes. Organizations must fix system issues that result in poor health and invest in workforce wellness.

Infection prevention professionals (IPs) reduce and eliminate hospital associated infections (HAIs) through evidence-based infection control programming within health care systems. IPs come from diverse professional backgrounds (eg, epidemiologists, nurses, doctors, public health professionals, microbiologists), and have played a critical role in preventing the spread of SARS-CoV-2 (COVID-19) in acute and outpatient settings. During the COVID-19 pandemic, IPs have had to manage rapidly changing prevention guidance, shortages in personal protection equipment, and increases in HAIs and workload,[1] which have added substantial stress to their job.

Chronic stress impacts health care professionals' mental health (eg, anxiety, stress, depression, and burnout) and physical well-being.[2] Engaging in healthy lifestyle behaviors, such as obtaining ≥7 hours of sleep per night, exercising ≥150 minutes per week, and

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Melnyk – Dr. Melnyk is the creator of MINDSTRONG and has a company, COPE2Thrive, LLC, that disseminates the original versions of this program for children, teens and young adults, which are entitled COPE (Creating Opportunities for Personal Empowerment). Hsieh – No conflicts to disclose. Jopp – NNPHI CDC Sub-grant for IPC education. Miller - No conflicts to disclose.

https://doi.org/10.1016/j.ajic.2022.04.004
0196-6553/

eating ≥5 servings of fruits and vegetables per day are known to support improvements in mental and physical health.[3] However, health care professionals often do not meet these guidelines.[4] Deficits in clinician well-being can proliferate employee turnover[5] and negatively influence high-value care.[2]

Clinicians that perceive their workplace as being supportive of well-being tend to have better mental and physical health outcomes than clinicians that do not feel the same level of support.[2,4] The impact of workplace wellness support has been studied in nurses and physicians, but a paucity in the research remains for IPs. As the Association for Professionals in Infection Control and Epidemiology (APIC) advances the role for IPs in the 21st century,[6] it is important to understand the current state of IPs' health and well-being so that targeted interventions can be implemented to ensure safe high-value care.

Therefore, the aims of the current study were threefold: (1) describe the health (mental & physical) and healthy lifestyle behaviors of IPs; (2) compare the healthy lifestyle behaviors and health of IPs in various roles; and (3) examine the associations among healthy lifestyle behaviors, mental and physical health, IP role, perceived support of worksite wellness, work shift length, and race and ethnicity.

METHODS

Design, sample, and recruitment

This study used a cross-sectional, descriptive correlational design. Exempt status was granted by the first author's Institutional Board Review (IRB). Data were collected between July and August 2021.

The study population was IP members of APIC. The association emailed study information and the survey link to a random selection of 6,000 members (out of 16,000 members). The email stated that participation was voluntary, anonymous, and that there was no obligation to complete the survey.

Measures

Survey questions included gender, race and ethnicity, age, and primary role in infection prevention for demographic data collection. The remaining survey questions aimed to assess IP health and well-being (mental and physical).

Healthy Lifestyle Behaviors

Questions were guided by the Centers for Disease Control and Prevention's (CDC) healthy behavior guidelines[7] and inquired about hours of sleep obtained/night, minutes of physical activity obtained and/or week, number of fruits and vegetables eaten and/or day, and extent of tobacco and alcohol use.

COVID-19 Impact on Healthy Behaviors. After each healthy lifestyle behavior question, participants were asked if COVID-19 impacted their healthy lifestyle behaviors in a positive or negative way.

Patient Health Questionnaire-2 (PHQ-2)

The PHQ-2 was used to measure depressive symptoms as it is valid, reliable, and widely utilized.[8] The 2 itemed instrument inquires about the frequency of depressive symptoms experienced over the past 2 weeks. Participants respond to the items using a 4 point Likert-type scale, 0 (not at all) to 3 (nearly every day). The Cronbach's α for this sample was 0.83.

Generalized Anxiety Disorder-2 (GAD-2)

The GAD-2 was used to measure anxiety as it is valid and reliable.[9] The 2 itemed instrument inquires about the frequency of anxiety symptoms experienced over the past 2 weeks. Participants respond to the items using a 4 point Likert-type scale, 0 (not at all) to 3 (nearly every day). The Cronbach's α for this sample was 0.83.

Perceived Stress Scale-4 (PSS-4). The PSS-4 was used to measure stress perception as it is valid and reliable.[10,11] The 4 item instrument assess the respondent's extent of perceived stress by inquiring about their ability to control important things in their life, confidence about handling personal problems, perception of things going their way, and inability to overcome current difficulties over the past month. Participants responded to the items using a 5 point Likert-scale, 0 (never) to 4 (very often), and higher scores indicate higher perceived stress. The Cronbach's α for this sample was 0.78.

Professional Quality of Life (ProQOL)

The ProQOL was used to assess IP's professional quality of life.[12] Four questions from the ProQOL Scale were used: "I feel worn out because of my work;" "I feel trapped by my job;" "I am not as engaged with my patients today as I used to be;" and "I believe I can make a difference through my work." Participants responded to the questions using a 5 point Likert scale from 1 (never) to 5 (very often). The Cronbach's α for this sample was 0.79.

Burnout.

A non-proprietary 1 item measure that has been reported as a viable replacement for the proprietary single-item Maslach Burnout Inventory (MBI) was used to assess burnout in the current sample.[13] The non-proprietary measure asks, "Overall, based on your definition of burnout, how would you rate your level of burnout?" Participants use a 5 category ordinal scale to score responses: 1 = no symptoms; 2 = occasional stress, but don't feel burned out; 3 = definitely burning out and am experiencing physical or emotion exhaustion; 4 = symptoms of burnout won't go away; and 5 = I feel completely burned out and often wonder if I can go on.

Self-Reported Mental and Physical Health and COVID-19

Self-reported mental health was obtained by asking "On a scale of 0-10, how would you rate your current mental health? [0 being very unhealthy to 10 being extremely healthy]" Self-reported physical health was obtained in a similar matter with the same scale. Following the scaled mental and/or physical health questions, participants were asked "Has your mental/physical health been impacted by COVID-19?" Available responses were, "No," "Yes, I am physically/mentally healthier as a result of COVID-19," and "Yes, I am not as physically/mentally healthy as a result of COVID-19."

Shift Length

Clinician mental health can be impacted by the number of hours worked,[14] thus, respondents in this study were asked to select their typical shift length. Options were less than 8 hours, 8-10 hours, 11-12 hours, and 12+ hours.

Workplace Wellness Support

Workplace wellness support was assessed by asking "How supportive is your work environment of personal wellness?" Participants responded to this question using a 5 point Likert scale, 0 (not at all) – 4 (very much).

Statistical analysis

Descriptive statistics were used to summarize sample characteristics, IPs' healthy lifestyle behaviors, mental and physical health, and the changes impacted by COVID-19. Multiple logistic regression models were used to examine the associations between each healthy lifestyle behavior, and health measure and IPs' primary role in infection prevention and control, perceived support of worksite wellness, work shift length, and race and ethinicity, adjusting for other sample

characteristics. Each healthy lifestyle behavior and health measure was analyzed separately in the multiple logistic regression and dichotomized as better or worse categories. Better categories included sufficient sleep (7+ hours per night), adequate physical activities (150+ minutes of moderate physical activities per week), healthy eating (5+ servings of fruits/veggies per day), not current smoker, no/light alcohol use (≤3 times per week), better physical health (self-rated physical health score of 6-10), better mental health (self-rated mental health score of 6-10), no symptoms of depression (PHQ-2 score of ≤2), no symptoms of anxiety (GAD-2 score of ≤2), no and/or little stress (PSS-4 score of ≤4), high ProQOL (ProQOL-4 score of ≥12), and no burnout.

Multiple logistic regression modeling was also used to examine the association between odds of having a negative impact from COVID-19 on each healthy lifestyle behaviors and health measure and IPs' primary role in infection prevention and control, perceived support of worksite wellness, work shift length, and race and ethnicity, adjusting for other sample characteristics. Each negative impact indicator was analyzed separately in the multiple logistic regression model and was dichotomized as having a negative impact (yes vs no). The "yes" category included (1) negative impact on sleep by either slept more or less, (2) less physical activities, (3) eating less healthy, (4) more smoking, (5) more alcohol drinking, (7) worse physical health, and (8) worse mental health.

In the multiple logistic regression models, IPs' primary role was categorized as front line and practicing IP, IP administrator and director, and other; the perceived workplace wellness support was categorized as not at all or a little, somewhat, and moderately or very much. For work shift length, the comparisons were conducted across ≤8 hours, 9-10 hours, and ≥11 hours, and the comparisons for race were mainly focused on white versus non-white. Some of other covariates were also re-categorized for model fitting, including age (<35, 35-44, 45-54, 55-64, and 65+), degree (bachelor's or lower, master's or higher, and other), and primary health care setting (acute care or not). All the analyses were conducted in R 4.0.5.

RESULTS

Sample characteristics

The survey received 926 completed responses (15% response rate). Most respondents were female (93.5%), non-Hispanic white (86.8%), married or in a relationship (82.5%), and had a bachelor's (41.2%) or master's (42.3%) degree. A majority (77.1%) of the IPs were between 35 and 64 years old, and most (58.2%) worked 9-10 hours per day. About two thirds (68.1%) of the IPs worked in acute care settings (Table 1).

Healthy lifestyle behaviors and related changes during COVID-19 pandemic

A small proportion of the IPs met the CDC recommended guidelines for sleep, physical activity, and fruit and vegetable consumption. About one third (34.1%) slept ≥7 hour per night. Only 18.8% participated in ≥150 minutes of moderate physical activities per week and 7.3% consumed ≥5 servings of fruits and vegetables per day. Most IPs were not current smokers (92.1%); 128 (13.9%) never drank; 640 (69.3%) were light drinkers (≤3 times/week); and 156 (16.9%) drank ≥4 times and/or week (Table 1).

Table 1 also shows the impact of the COVID-19 pandemic on IPs' healthy lifestyle behaviors. Most (77.0%) reported that the pandemic negatively affected their sleep, either through sleeping less (71.5%) or through sleeping more (5.5%). More than half reported less physical activity (64.5%) and less healthy eating (61.1%) during the pandemic. The pandemic had some impact on smoking with 58 (6.4%) reporting

Table 1
Infection prevention professionals' demographics, healthy lifestyle behaviors, and self-reported mental/physical health (N = 926)

Characteristics	N (%)*
Demographics	
Age	
<25	1 (0.1)
25-34	124 (13.6)
35-44	201 (22.0)
45-54	212 (23.2)
55-64	292 (31.9)
65+	84 (9.2)
Gender	
Male	60 (6.5)
Female	860 (93.5)
Race/Ethnicity	
Non-Hispanic White	797 (86.8)
Non-Hispanic Black	28 (3.1)
American Indian/Alaskan Native	11 (1.2)
Asian/Pacific Islander	26 (2.8)
Hispanic	28 (3.1)
Multiracial/Other	28 (3.1)
Marital/Relationship Status	
Never married, divorced, or widowed	161 (17.5)
Married or in a relationship	760 (82.5)
Degree	
Associate's	110 (11.9)
Bachelor's	381 (41.2)
Master's	391 (42.3)
Doctorate	18 (1.9)
Other	24 (2.6)
Hours of workday/Shift	
<8	15 (1.6)
8	223 (24.1)
9-10	538 (58.2)
11-12	115 (12.4)
12+	33 (3.6)
Primary Health Care Setting	
Acute care	627 (68.1)
Ambulatory surgical centers	49 (5.3)
Outpatient clinics	37 (4.0)
Long term (acute) care	107 (11.6)
Other	101 (11.0)
Healthy Behaviors	
Hours of sleep per night	
<7	610 (65.9)
7+	315 (34.1)
Minutes of moderate physical activity per week	
<150	751 (81.2)
150+	174 (18.8)
Servings of fruits/vegies per day	
<5	857 (92.7)
5+	67 (7.3)
Current Smoker	
Yes	73 (7.9)
No	852 (92.1)
Alcohol Use	
Never	128 (13.9)
≤3 times/week	640 (69.3)
4+ times/week	156 (16.9)
COVID Impact on Healthy Behaviors	
Sleep	
Not negatively impacted	213 (23.0)
Negatively impacted	712 (77.0)
Less than usual	661 (71.5)
More than usual	51 (5.5)
Physical activity	
No change	308 (33.3)
Less than usual	597 (64.5)
More than usual	20 (2.2)
Eating	
No change	276 (29.8)
Less healthy	565 (61.1)
More healthy	84 (9.1)
Increased smoking since COVID	

(*continued*)

Table 1 (*Continued*)

Characteristics	N (%)*
No	855 (93.6)
Yes	58 (6.4)
Increased alcohol use during COVID	
No	577 (62.6)
Yes	345 (37.4)
Physical/Mental health	
Physical health	
0-5	286 (31.1)
6-10	635 (68.9)
Mental health	
0-5	313 (34.0)
6-10	608 (66.0)
PHQ-2	
≤2	723 (78.5)
≥3	198 (21.5)
GAD-2	
≤2	647 (70.2)
≥3	274 (29.8)
PSS-4	
0-4	279 (30.4)
5-16	640 (69.6)
ProQOL-4	
0-11	760 (83.1)
12-16	155 (16.9)
Burnout	
No	320 (34.8)
Yes	600 (65.2)
COVID impact on physical health	
No change	326 (35.2)
Better	44 (4.8)
Worse	555 (60.0)
COVID impact on mental health	
No change	219 (23.7)
Better	21 (2.3)
Worse	683 (74.0)

*The percentages are based on non-missing values.

increased smoking. Additionally, 37.4% reported increased alcohol intake due to the pandemic.

Mental/Physical health and the related changes during the COVID-19 pandemic

About two thirds of the IPs self-scored themselves as having good physical (68.9%) and mental (66.0%) health. Twenty-one percent of IPs screened positive for depression (PHQ-2 ≥ 3) and 29.8% screened positive for anxiety (GAD-2 ≥ 3). Only a small proportion of IPs (16.9%) reported high ProQOL. The majority of IPs indicated that COVID-19 had adversely impacted their mental and physical health, with 74.0% reporting worse mental health and 60.0% reporting worse physical health (Table 1).

Associations of IPs' primary role in infection prevention and control with healthy lifestyle behaviors and the related changes during COVID-19 pandemic

The proportions were similar between front line and practicing IPs and IP administrators/directors in ≥7 hours of sleep per night, 150 + minutes moderate physical activity per week, 5 or more servings of fruits and vegies per day, no smoking, and no or light alcohol use; while IPs working in other roles had larger proportions in ≥7 of sleep per night, 150+ minutes moderate physical activity per week, and no smoking, but smaller proportions in 5 or more servings of fruits and vegies per day, and no or light alcohol use. Larger proportions of IP administrators and directors and smaller proportions of IPs in other roles were negatively impacted by COVID-19 pandemic compared to front line and practicing IPs. IP administrators and directors had similar odds with front line and practicing IPs in all health lifestyle behaviors and related changes, while other IPs had a higher odds (OR = 2.68, 95% CI: 1.24 − 5.66; Table 2) in 150+ minutes moderate physical activity per week compared to front line and practicing IPs after adjusting for age, gender, race and ethnicity, marital status, education, hours of workday or shift, health care settings, and perceived support of wellness in the multiple logistic regression models.

Associations of IPs' primary role in infection prevention and control with health and the related changes during COVID-19 pandemic

IPs working in other roles had larger proportions of good health regarding all health measures compared to front line and practicing IPs and IP administrators and directors, while front line and practicing IPs and IP administrators and directors had similar proportions. About 60% of the IPs across different roles reported worsening physical health due to COVID-19, but larger proportions of front line and practicing IPs (74.1%) and IP administrators and directors (76.3%) were negatively impacted in mental health than other roles (61.4%). IP administrators and directors were more likely to have good physical health (OR = 1.45, 95% CI: 1.02-2.09) and IPs in other roles were more likely to have high professional QOL (OR = 2.70, 95% CI: 1.11-6.35) compared to front line and practicing IPs after adjusting for age, gender, race and ethnicity, marital status, education, hours of workday or shift, health care settings, and perceived support of wellness in the multiple logistic regression models. There were no significant differences in the odds of IP administrators and directors and other IPs to have negative changes during the pandemic compared to front line and practicing IPs.

Associations of workplace wellness support with healthy lifestyle behaviors and the related changes during COVID-19 pandemic

The proportion of IPs who had ≥7 hours of sleep per night increased with higher perceived workplace wellness support (28.3%, 30.4%, and 40.2%, respectively, for not at all and/or a little, somewhat, and very much and/or moderately; Table 3). Similar trends for other healthy lifestyle behaviors also were observed, including weekly physical activities and no smoking. Compared to those whose workplaces provided a little or no support, IPs whose workplaces supported wellness very much or moderately had 67% higher odds for obtaining 7 hours of sleep per night (OR = 1.67, 95% CI: 1.17-2.40) after adjusting for age, gender, race and ethnicity, marital status, education, hours of workday or shift, health care settings, and primary roles in infection prevention and control in the multiple logistic regression models. IPs with very much or moderate support were less likely to report a negative impact of COVID-19 pandemic on their healthy lifestyle behaviors compared to those with a little or no support. Those with very much or moderate support had a 35% lower odds (OR = 0.65, 95% CI: 0.43 − 0.97) of being impacted in sleep and a 43% lower odds (OR = 0.57, 95% CI: 0.40-0.81) of being impacted in physical activities compared to those with no or a little support.

Associations of workplace wellness support with health and the related changes during COVID-19 pandemic

The proportions of IPs reporting good health in all health measures increased as the wellness support level increased. The significant relationship between greater perceived support of wellness and better health held after adjusting for IPs' age, gender, race and ethnicity, marital status, education, hours of workday or shift, health care

Table 2
The relationship of infection prevention professionals' primary role with their healthy lifestyle behaviors, mental/physical health and the changes during COVID-19 pandemic

	Professionals' primary role in infection prevention and control				
	N (%)			Adjusted odds ratio (95% CI)*	
	Front line/ Practicing IP (N = 649)	IP administrator/ Director (N = 228)	Other (N = 45)	IP administrator/ director vs Front line/ Practicing IP	Other vs Front line/ Practicing IP
Good Healthy Lifestyle Behavior					
7+ hours sleep per night	218 (33.6)	75 (32.9)	21 (46.7)	1.20 (0.85-1.70)	1.70 (0.82-3.53)
150+ mins moderate physical activity per week	111 (17.1)	46 (20.2)	17 (37.8)	1.30 (0.86-1.93)	2.68 (1.24-5.66)
5+ servings of fruits/vegies per day	48 (7.4)	18 (7.9)	1 (2.2)	1.02 (0.55-1.82)	0.19 (0.01-1.00)
No smoking	601 (92.6)	206 (90.4)	43 (95.6)	0.76 (0.44-1.36)	1.48 (0.39-9.67)
No/light alcohol use	547 (84.4)	184 (80.7)	34 (75.6)	0.81 (0.54-1.24)	0.75 (0.34-1.83)
Negative Impact of COVID on Healthy Lifestyle Behavior					
Less/more sleep	499 (76.9)	183 (80.3)	27 (60.0)	0.97 (0.65-1.46)	0.59 (0.28-1.26)
Less physical activities	411 (63.3)	160 (70.2)	24 (53.3)	1.08 (0.76-1.54)	0.62 (0.30-1.28)
Less healthy eating	390 (60.1)	148 (64.9)	24 (53.3)	1.14 (0.81-1.60)	1.05 (0.52-2.16)
Increased smoking	38 (5.9)	18 (8.0)	2 (4.7)	1.34 (0.71-2.45)	0.91 (0.14-3.52)
Increased alcohol use	234 (36.1)	97 (42.9)	14 (31.1)	1.28 (0.92-1.77)	0.75 (0.33-1.60)
Good Health					
Good physical health	434 (67.2)	165 (72.7)	34 (75.6)	1.45 (1.02-2.09)	1.39 (0.63-3.31)
Good mental health	423 (65.4)	146 (64.6)	36 (80.0)	0.97 (0.69-1.38)	1.80 (0.78-4.55)
No depression	508 (78.5)	174 (76.7)	39 (88.6)	0.96 (0.66-1.42)	2.42 (0.89-8.54)
No anxiety	447 (69.2)	162 (71.4)	36 (80.0)	1.10 (0.77-1.59)	1.34 (0.59-3.38)
No/little stress	196 (30.3)	63 (27.8)	19 (43.2)	0.97 (0.67-1.39)	1.49 (0.70-3.10)
High professional QOL	105 (16.3)	35 (15.8)	14 (31.8)	1.26 (0.77-2.02)	2.70 (1.11-6.35)
No burnout	230 (35.5)	66 (29.2)	24 (53.3)	0.85 (0.59-1.23)	1.87 (0.88-3.99)
Negative Impact of COVID on Health					
Worsen physical health	390 (60.1)	136 (59.6)	27 (60.0)	0.80 (0.58-1.12)	0.98 (0.48-2.02)
Worsen mental health	480 (74.1)	174 (76.3)	27 (61.4)	0.98 (0.67-1.45)	0.59 (0.28-1.29)

NOTE. Dependent variable – each behavior/health measure; Primary independent variable of interest – professionals' primary role in infection prevention and control; Covariates – age, gender, race/ethnicity, marital status, degree, hours of work day/shift, primary health care setting, and perceived support of wellness.
*Odds ratios (OR) and 95% confidence intervals (CI) were derived from logistic regression models.

Table 3
The relationship of perceived support of worksite wellness with infection prevention professionals' healthy lifestyle behaviors, mental/physical health and the changes during COVID-19 pandemic

	Perceived support of wellness at the place of employment				
	N (%)			Adjusted odds ratio (95% CI)*	
	Not at all/A little (N = 247)	Somewhat (N = 273)	Very much/ Moderately (N = 403)	Somewhat vs Not at all/ A little	Very much/ Moderately vs Not at all/ A little
Good Healthy Lifestyle Behavior					
7+ hours sleep per night	70 (28.3)	83 (30.4)	162 (40.2)	1.02 (0.68-1.52)	1.67 (1.17-2.40)
150+ mins moderate physical activity per week	42 (17.0)	49 (17.9)	83 (20.6)	1.07 (0.66-1.72)	1.27 (0.83-1.97)
5+ servings of fruits/vegies per day	21 (8.5)	12 (4.4)	34 (8.4)	0.56 (0.26-1.18)	1.02 (0.57-1.88)
No smoking	219 (88.7)	254 (93.0)	377 (93.5)	1.79 (0.94-3.48)	1.63 (0.91-2.93)
No/light alcohol use	198 (80.2)	230 (84.2)	338 (84.1)	1.32 (0.83-2.11)	1.40 (0.91-2.15)
Negative Impact of COVID on Healthy Lifestyle Behavior					
Less/more sleep	197 (79.8)	221 (81.0)	292 (72.5)	1.01 (0.63-1.60)	0.65 (0.43-0.97)
Less physical activities	174 (70.4)	192 (70.3)	229 (56.8)	1.00 (0.67-1.49)	0.57 (0.40-0.81)
Less healthy eating	160 (64.8)	170 (62.3)	233 (57.8)	0.85 (0.58-1.23)	0.76 (0.54-1.07)
Increased smoking	23 (9.4)	16 (5.9)	19 (4.8)	0.60 (0.29-1.19)	0.53 (0.27-1.03)
Increased alcohol use	100 (40.5)	100 (36.6)	145 (36.2)	0.85 (0.59-1.24)	0.85 (0.60-1.19)
Good Health					
Good physical health	151 (61.1)	180 (65.9)	303 (75.9)	1.16 (0.80-1.70)	1.94 (1.35-2.79)
Good mental health	133 (53.8)	182 (66.9)	291 (72.8)	1.81 (1.24-2.65)	2.36 (1.65-3.37)
No depression	172 (69.9)	212 (77.9)	338 (84.3)	1.51 (1.00-2.28)	2.20 (1.48-3.28)
No anxiety	137 (55.5)	188 (69.4)	321 (80.0)	1.86 (1.28-2.72)	3.20 (2.22-4.63)
No/little stress	44 (18.0)	66 (24.4)	168 (41.8)	1.44 (0.93-2.25)	3.21 (2.18-4.81)
High professional QOL	13 (5.3)	22 (8.1)	119 (30.0)	1.77 (0.84-3.86)	9.00 (4.91-18.02)
No burnout	50 (20.3)	76 (28.1)	194 (48.1)	1.77 (1.14-2.77)	4.09 (2.76-6.16)
Negative Impact of COVID on Health					
Worsen physical health	166 (67.2)	173 (63.4)	214 (53.1)	0.86 (0.59-1.26)	0.57 (0.40-0.80)
Worsen mental health	194 (78.9)	221 (81.2)	267 (66.3)	1.10 (0.70-1.75)	0.51 (0.34-0.75)

NOTE. Dependent variable – each behavior/health measure; Primary independent variable of interest – perceived support of wellness at the place of employment; Covariates – age, gender, race/ethnicity, marital status, degree, hours of work day/shift, primary health care setting, and primary role in infection prevention and control.
*Odds ratios (OR) and 95% confidence intervals (CI) were derived from logistic regression models.

Table 4
The relationship of infection prevention professionals' work shifts with their healthy lifestyle behaviors, mental/physical health and the changes during COVID-19 pandemic

	Hours of work day/shift				
	N (%)			Adjusted odds ratio (95% CI)*	
	≤8 hours (N = 238)	9-10 hours (N = 538)	≥11 hours (N = 148)	9-10 hours vs ≤8 hours	≥11 hours vs ≤8 hours
Good Healthy Lifestyle Behavior					
7+ hours sleep per night	117 (49.2)	167 (31.0)	31 (20.9)	0.45 (0.32-0.62)	0.26 (0.15-0.43)
150+ mins moderate physical activity per week	53 (22.3)	96 (17.8)	25 (16.9)	0.81 (0.55-1.22)	0.82 (0.46-1.43)
5+ servings of fruits/vegies per day	19 (8.0)	36 (6.7)	12 (8.1)	0.70 (0.38-1.32)	0.89 (0.39-1.98)
No smoking	222 (93.3)	494 (91.8)	135 (91.2)	0.88 (0.46-1.61)	0.88 (0.39-2.00)
No/light alcohol use	198 (83.2)	440 (81.9)	129 (87.2)	0.85 (0.55-1.29)	1.32 (0.71-2.50)
Negative Impact of COVID on Healthy Lifestyle Behavior					
Less/more sleep	146 (61.3)	435 (80.9)	130 (87.8)	2.66 (1.85-3.81)	4.23 (2.39-7.82)
Less physical activities	114 (47.9)	360 (66.9)	122 (82.4)	2.12 (1.52-2.95)	4.30 (2.59-7.34)
Less healthy eating	111 (46.6)	348 (64.7)	105 (70.9)	2.10 (1.52-2.92)	2.76 (1.73-4.44)
Increased smoking	12 (5.1)	36 (6.7)	10 (7.0)	1.29 (0.66-2.70)	1.21 (0.47-3.01)
Increased alcohol use	86 (36.1)	201 (37.5)	58 (39.5)	1.09 (0.78-1.52)	1.25 (0.79-1.97)
Good Health					
Good physical health	178 (75.1)	365 (68.2)	92 (62.2)	0.66 (0.46-0.96)	0.47 (0.29-0.76)
Good mental health	168 (70.9)	349 (65.2)	90 (60.8)	0.74 (0.52-1.06)	0.58 (0.36-0.94)
No depression	192 (81.4)	422 (78.7)	108 (73.0)	0.89 (0.59-1.34)	0.65 (0.38-1.10)
No anxiety	173 (73.6)	381 (70.9)	92 (62.2)	0.83 (0.57-1.20)	0.60 (0.36-0.97)
No/little stress	81 (34.3)	167 (31.2)	30 (20.4)	0.87 (0.61-1.23)	0.56 (0.33-0.93)
High professional QOL	60 (25.4)	81 (15.3)	13 (8.8)	0.49 (0.32-0.75)	0.31 (0.15-0.62)
No burnout	117 (49.4)	171 (32.0)	32 (21.6)	0.45 (0.32-0.64)	0.31 (0.18-0.51)
Negative Impact of COVID on Health					
Worsen physical health	111 (46.6)	334 (62.1)	109 (73.6)	2.02 (1.46-2.80)	3.34 (2.08-5.44)
Worsen mental health	156 (65.8)	407 (75.8)	120 (81.1)	1.67 (1.16-2.40)	2.21 (1.30-3.83)

NOTE. Dependent variable – each behavior/health measure; Primary independent variable of interest – hours of work day/shift; Covariates – age, gender, race/ethnicity, marital status, degree, primary health care setting, primary role in infection prevention and control, and perceived support of wellness.
*Odds ratios (OR) and 95% confidence intervals (CI) were derived from logistic regression models.

settings, and primary roles in infection prevention and control. IPs whose workplaces provided somewhat support were more likely to have good mental health (OR = 1.81, 95% CI: 1.24-2.65), no depression (OR = 1.51, 95% CI: 1.00-2.28), no anxiety (OR = 1.86, 95% CI: 1.28-2.72), and no burnout (OR = 1.77, 95% CI: 1.14-2.77) compared to those with no or a little support. IPs whose workplaces supported wellness very much or moderately had significantly higher odds in all health indicators compared to those with no or a little support, and the odds ratios ranged from 1.94 for physical health to 9.00 for high professional QOL. IPs with very much or moderate wellness support were less likely to report negative impacts of COVID-19, and they had 43% lower odds (OR = 0.57, 95% CI: 0.40-0.80) of having worse physical health and 49% lower odds (OR = 0.51, 95% CI: 0.34-0.75) of having worse mental health when compared to those with no or a little support.

Associations of shift length with healthy lifestyle behaviors and the related changes during COVID-19 pandemic

The proportion of IPs who had seven or more hours of sleep per night decreased with longer workday or shift (49.2%, 31.0% 20.9%, respectively, for ≤8, 9-10, 11+ hours per day; Table 4). Similar trends for other good healthy lifestyle behaviors also were observed, including 150+ minutes moderate physical activity per week and no smoking. The significant relationship between longer shift length and lower likelihood of having ≥7 hours sleep per day held after adjusting for IPs' age, gender, race and ethnicity, marital status, education, primary health care setting, primary role in infection prevention and control, and perceived support of wellness in the multiple logistic regression models. Compared to IPs with workday or shift of ≤8 hours per day, those who worked 9-10 hours or 11+hours per day were less likely to sleep 7 or more hours per night (OR = 0.45, 95% CI: 0.32-0.62; OR = 0.25, 95% CI: 0.15-0.43). Table 4 also shows that higher percentages of IPs who worked longer hours per day reported a negative impact of COVID-19 pandemic on their healthy lifestyle behaviors than those who worked ≤8 hours per day. The significant relationships between longer shift length and higher likelihood of negative impact of COVID-19 pandemic on sleep (OR: 2.66-4.23), physical activities (OR: 2.12-4.30), and eating (OR: 2.10-2.76) held after adjusting for nurses' age, gender, race and ethnicity, marital status, education, primary health care setting, primary role in infection prevention and control, and perceived support of wellness in the multiple logistic regression models.

Associations of shift length with health and the related changes during COVID-19 pandemic

The proportion of IPs with good health regarding all health indicators decreased with longer workdays or shifts. The significant relationship between longer workday or shift length and worse health held after adjusting for IPs' age, gender, race and ethnicity, marital status, education, primary health care setting, primary role in infection prevention and control, and perceived support of wellness in the multiple logistic regression models. Compared to IPs that worked ≤8 hours per day, those who worked 9-10 hours per day were less likely to have good physical health (OR = 0.66, 95% CI: 0.46-0.96), high ProQOL (OR = 0.49, 95% CI: 0.32-0.75), and no burnout (OR = 0.45, 95% CI: 0.32-0.64); and those who worked 11+ hours per day were less likely to have good physical health (OR = 0.47, 95% CI: 0.29-0.76), good mental health (OR = 0.58, 95% CI: 0.36-0.94), no anxiety (OR = 0.60, 95% CI: 0.36-0.97), no and/or little stress (OR = 0.56, 95% CI: 0.33-0.93), higher ProQOL (OR = 0.31, 95% CI: 0.15-0.62), and no burnout (OR = 0.31, 95% CI: 0.18-0.51). IPs who worked 9-10 hours or 11+ hours per day were more likely to report worsening physical health (OR = 2.02, 95% CI: 1.46-2.80; OR = 3.34, 95% CI: 2.08-5.44) and worsening mental health (OR = 1.67, 95% CI: 1.16-2.40; OR = 2.21, 95% CI: 1.30-3.83) due to the pandemic.

Table 5
The relationship of infection prevention professionals' race/ethnicity with their healthy lifestyle behaviors, mental/physical health and the changes during COVID-19 pandemic

	Race		
	N (%)		Adjusted odds ratio (95% CI)*
	White (N = 797)	Minorities (N = 121)	Minorities vs White
Good Healthy Lifestyle Behavior			
7+ hours sleep per night	281 (35.3)	32 (26.4)	0.60 (0.37-0.93)
150+ mins moderate physical activity per week	157 (19.7)	16 (13.2)	0.61 (0.34-1.06)
5+ servings of fruits/vegies per day	64 (8.0)	3 (2.5)	0.26 (0.06-0.73)
No smoking	731 (91.7)	114 (94.2)	1.59 (0.73-3.98)
No/light alcohol use	655 (82.3)	107 (88.4)	1.85 (1.05-3.51)
Negative Impact of COVID on Healthy Lifestyle Behavior			
Less/more sleep	616 (77.3)	90 (74.4)	0.88 (0.55-1.43)
Less physical activities	509 (63.9)	82 (67.8)	1.27 (0.83-1.99)
Less healthy eating	493 (61.9)	68 (56.2)	0.87 (0.58-1.31)
Increased smoking	53 (6.7)	5 (4.1)	0.50 (0.17-1.21)
Increased alcohol use	305 (38.4)	39 (32.2)	0.67 (0.43-1.02)
Good Health			
Good physical health	542 (68.2)	88 (73.3)	1.28 (0.82-2.04)
Good mental health	517 (65.1)	88 (72.7)	1.58 (1.01-2.52)
No depression	617 (77.7)	100 (82.6)	1.44 (0.87-2.48)
No anxiety	555 (69.9)	90 (74.4)	1.40 (0.89-2.25)
No/little stress	238 (30.1)	40 (33.1)	1.23 (0.79-1.89)
High professional QOL	131 (16.6)	23 (19.2)	1.23 (0.69-2.12)
No burnout	279 (35.2)	40 (33.1)	0.87 (0.55-1.36)
Negative Impact of COVID on Health			
Worsen physical health	490 (61.5)	60 (49.6)	0.59 (0.39-0.88)
Worsen mental health	596 (75.0)	83 (68.6)	0.63 (0.41-1.00)

NOTE. Dependent variable – each behavior/health measure; Primary independent variable of interest – race; Covariates – age, gender, marital status, degree, hours of work day/shift, primary health care setting, primary role in infection prevention and control, and perceived support of wellness.
*Odds ratios (OR) and 95% confidence intervals (CI) were derived from logistic regression models.

Associations of Race/Ethnicity with healthy lifestyle behaviors and the related changes during COVID-19 pandemic

In terms of healthy lifestyle behaviors, white IPs reported obtaining ≥7 hour of sleep per night, 150+ minutes of moderate physical activity per week, and ≥5 servings of fruits and vegetables per day more frequently than racial and ethnic diversity IPs. However, racial and ethnic diversity IPs reported no smoking and no or light alcohol use more frequently than white IPs. After adjusting for IPs' age, gender, marital status, education, hours of workday or shift, primary health care setting, primary role in infection prevention and control, and perceived support of wellness in the multiple logistic regression models, racial and ethnic diversity IPs had 85% higher odds (OR = 1.85, 95% CI: 1.05-3.51; Table 5) of no or light alcohol use compared to white IPs. There were no significant differences in the odds of negative impact of COVID-19 on healthy lifestyle behaviors between white IPs and IPs from racially and ethnically diverse backgrounds.

Associations of Race/Ethnicity with health and the related changes during COVID-19 pandemic

Racial and ethnic diversity IPs had larger proportions in having good physical health, good mental health, no depression, no anxiety, no/little stress, and high professional QOL than white IPs. The significant relationship between race and ethnicity and good mental health held after adjusting for other demographical variables. Racial and ethnic diversity IPs were more likely to have good mental health (OR = 1.58, 95% CI: 1.01–2.52) and less likely to be impacted by COVID-19 on physical health (OR = 0.59, 95% CI: 0.39-0.88) than white IPs.

DISCUSSION

This study's findings indicate that IPs in other roles and with increased workplace wellness support and shorter workday or shift lengths had better well-being outcomes during the pandemic than front line and practicing IPs, IP administrators and directors, and those with less workplace wellness support and longer shift lengths. Overall, only a small proportion of IPs (16.8%) reported high professional QOL and 65.2% had symptoms of burnout. Three fourths reported worsening mental health and three fifths reported worsening physical health due to stressors related to the COVID-19 pandemic. Such trends have been observed across the general population as well. According to an American Psychological Association survey, psychologists have reported substantial treatment demand increases for anxiety, depression, trauma disorders, and sleep disturbances in 2021 when compared to 2020.[15] Only 34.1% of IPs in the current study slept ≥7 hours per night, 18.8% participated in ≥150 minutes of moderate physical activities per week, and 7.3% consumed ≥5 servings of fruits and vegetables per day. These findings signal that IPs are facing a well-being crisis similar to their practicing clinician counterparts.[16,17]

A prior qualitative study with IPs identified workplace culture, organizational leadership, and management as contributors to staff burnout and low morale during COVID-19.[18] The current study found that as workplace culture in the form of workplace wellness support increased, IPs reporting good health also increased, thus substantiating the importance of workplace wellness culture on mitigating the negative impacts of COVID-19 stressors on the well-being of IPs.

Nationally, there is a 25% vacancy rate for IPs and 40% of the current IP workforce is expected to retire over the next 10 years.[19,20]

Retainment and recruitment of highly skilled IPs is therefore of utmost importance to infection prevention leadership. Considering that poor clinician well-being increases turnover,[5] APIC must continue to endorse the importance of investing in worksite wellness cultures that promote well-being through "empowerment, risk-taking, engagement, resilience, transparency, and respect".[6(pp 354)] Doing so requires a strategic approach with organizational and individual level interventions. These include fixing system issues that are known to cause burnout and poor health (eg, short staffing, problems with the electronic medical record), hiring Chief Wellness Officers to focus on improving their organization's culture and work environment, implementing targeted interventions to promote resilience and self-care, performing anonymous mental health screening and referrals to treatment, and instituting shorter shift lengths.[17,21,22] Providing manualized cognitive-behavioral skills building programs to clinicians, like MINDBODYSTRONG, have been shown to decrease depression, anxiety, and stress and improve job satisfaction.[23,24] Anonymous mental health screening programs, like HEAR (Healer Education Assessment and Referral), have also been successful in identify clinicians with depression, anxiety, and suicidal ideation and connecting them with treatment options.[25,26]

This study did have some limitations. For example, while the correlation between workplace wellness support, shift length, and improved IP health outcomes is critical, the relationships were correlative and not causative. Because this study was cross sectional in nature, it is unclear whether the negative impact that COVID-19 had on mental and physical health will stable out over time. However, the relationship between protective factors (like workplace wellness support) and positive outcomes appears to remain consistent; highlighting the importance of providing protective factor interventions on a large scale.[2,4,27] Lastly, some of the survey questions utilized self-scoring, which lacks objectivity.

CONCLUSIONS

IPs have played a critical role in preventing the spread of COVID-19 in acute and outpatient settings, but the resulting increases in stress have negatively impacted their mental and physical well-being. However, IPs with shorter shift lengths and more workplace wellness support had better well-being outcomes during the pandemic than those working longer shift lengths and having no workplace wellness support. APIC must continue to promote and provide guidance on instituting and sustaining work cultures that promote IPs well-being and fixing system issues known to cause burnout and other mental health problems as there is a growing body of evidence that poor mental and physical health in clinicians adversely impacts the quality and safety of health care.

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