



Lifestyle Behaviors and Parents' Mental Well-Being Among Low-Income Families During COVID-19 Pandemic

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Background: The coronavirus 2019 (COVID-19) pandemic has negatively altered many families' lifestyles and the mental well-being of parents, especially those who have a low income and young children. To improve low-income parents' mental well-being, especially during a pandemic, understanding parents' and children's lifestyle behaviors and the relationship between their lifestyle behaviors and parents' mental well-being is essential.

Objective: This cross-sectional study examined relationships between lifestyle behaviors (sleep, physical activity, screen time, and eating behavior of parents and children) and low-income parents' well-being (stress, anxiety, and depression) during COVID-19.

Methods: Parents were recruited from two Michigan Head Start organizations as well as across the United States; 408 parents completed an online survey. Demographic characteristics were assessed, along with parents' sleep, physical activity, screen time, and dietary intake; stress, anxiety, and depression were also examined. Children's sleep time, physical activity, screen time, and fruit/vegetable intake were assessed. Descriptive statistics, correlations, and the multivariate general linear model procedure were used.

Results: Approximately 69.4% of parents reported moderate stress levels, and 17.2% reported high levels. Most parents had sleep disturbances, attained minimal physical activity, and consumed <5 fruits/vegetables per day; average screen time was >2 hours per day. Only 41% of preschoolers were active 7 days a week and slept ≥10 hours per day. Two thirds had >2 hours per day of screen time, and less than one fifth consumed ≥5 fruits/vegetables per day. After adjusting for parents' demographics and children's lifestyle behaviors, parents' sleep disturbance was positively correlated with their levels of stress, anxiety, and depression. After controlling for parents' demographics and lifestyle behaviors, child sleep time was negatively associated with parents' stress levels. Family demographics and parents' and children's lifestyle behaviors explained 33.4%, 29.8%, and 28.1% of the variances in parents' stress, anxiety, and depression, respectively.

Discussion: Most parents and preschoolers were not meeting many lifestyle behavior recommendations, indicating a need for interventions. Improving parents' sleep quality and reducing bedtime challenges involving their preschoolers may be necessary for enhancing parental mental well-being.

Key Words: anxiety • children • depression • health behavior • stress

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The negative effects of COVID-19 have been particularly problematic for parents of young children (Prihaidko et al., 2020). In a national study conducted in the United States during COVID-19, a higher proportion of parents with children <5 years old than those with older children reported worsening mental well-being (Patrick et al., 2020). Because of day care and school closures, parents with young children faced difficulties balancing family and work life and making alternative childcare arrangements (Prihaidko et al., 2020). In addition, public day care (e.g., Head Start program) and school

closures in the United States limited access to national free and/or reduced-price school lunch and/or breakfast programs during COVID-19. This situation increased the risk of food insecurity, particularly among low-income and racial/ethnic minority families (Sharma et al., 2020), many of whom were experiencing greater employment losses, reductions in work hours, or decreases in job-related income, as compared to higher income (Karpman et al., 2020) or non-Hispanic White families (Parker et al., 2020), respectively.

Numerous stressors, likely experienced by low-income parents because of inadequate financial resources, have been associated with increased levels of parental stress (Glass et al., 2016). In a study conducted in the western United States, a sample of predominately low-income parents responded to an electronic checklist and reported experiencing an average of 3.5 stressors from COVID-19, along with

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adverse changes in their moods or overall stress. The majority indicated that they had slept poorly and had high anxiety and depressive symptoms. One encouraging finding that emerged was that higher perceived control over COVID-19 was related to lower perceived stress, suggesting that specific strategies may be effective for mitigating or protecting against stress or even depression and anxiety among low-income parents to enhance their mental well-being during a pandemic (Brown et al., 2020).

One potentially promising strategy to improve low-income parents' mental well-being during a pandemic may involve increasing their healthy lifestyle behaviors. This approach is supported by a study with Australian adults showing that negative changes in physical activity (PA) and sleep during the COVID-19 pandemic were associated with higher anxiety, stress, and depressive symptoms. Not surprisingly, low-income adults experienced significantly higher depressive symptoms than those with a higher income (Stanton et al., 2020). These findings are important to consider because the negative changes in parents' healthy lifestyle behaviors are likely modeled by their young children (Heerman et al., 2017).

Young children's lifestyle behaviors may also be associated with their parents' mental well-being. Results from a cross-sectional study conducted before the pandemic with low-income parents and their 3- to 5-year-old children from mainly Latino and African American communities showed that children's sleep duration was negatively related to parents' depressive symptoms. In contrast, the number of days per week children viewed a television at mealtime was positively associated with parents' depressive symptoms (Heerman et al., 2017). This information suggests that improving young children's lifestyle behaviors may be necessary for increasing their parents' mental well-being.

To direct interventions to improve parents' mental well-being, especially during a pandemic, increased understanding of parents' and children's lifestyle behaviors and the relationship between their lifestyle behaviors and parents' mental well-being is essential. Unfortunately, limited research has been conducted during a pandemic to examine these associations; no study was found that focused on low-income parents and their young children, such as those of preschool age. Therefore, the purpose of this study was to examine the relationships between lifestyle behaviors (sleep, PA, screen time, and eating behavior of parents and children) and low-income parents' well-being (stress, anxiety, and depression) during COVID-19.

METHODS

Design

The university institutional review board provided approval to conduct this cross-sectional study before data collection. Using an online survey delivered via Qualtrics (www.qualtrics.com), low-income parents provided data on their and their preschool

children's demographics and lifestyle behaviors, as well as on their own personal mental well-being. The data were used primarily to examine relationships between the lifestyle behaviors and parents' mental well-being. Perspectives from family stress theory, which emphasizes the need to understand the influence of both risk and protective factors on individuals' stress and mental health, were used to guide selection of the variables to be examined (Luthar et al., 2000; Patterson, 1988).

Participants

Data were collected from parents recruited from two Michigan Head Start organizations (one urban and one rural) and parents across the United States recruited via the Qualtrics panel—a web-based platform that can recruit a demographically representative sample (Boas et al., 2020). Parents from the Head Start organizations were included if they (a) had a 3- to 5-year-old child in a Head Start program, (b) identified as child's adult legal guardian, (c) were 18–70 years old, and (d) understood and spoke the English language. Inclusion criteria for parents from the Qualtrics panel are as follows: (a) resided in the United States, (b) had a 3- to 5-year-old child in a preschool before the COVID-19 pandemic began, (c) met the 2020 U.S. poverty thresholds based on family size and family income that was established by the U.S. Census Bureau (2021), (d) identified as the child's adult legal guardian, (e) were 18–70 years old, and (f) understood and spoke the English language.

Procedures and Data Collection

To recruit parents from the two Head Start organizations, an e-mail approved by the university institutional review board was sent to each family having a 3- to 5-year-old child. The e-mail invited one adult parent or legal guardian per family to complete the survey via Qualtrics. Adults received a \$20 Amazon e-gift card for completing and submitting the survey electronically with <10% missing data. If $\geq 10\%$ missing data were found after survey submission, parents were contacted and asked if they would provide the missing data.

To increase the sample size and include a more representative group of low-income parents with young children, the Qualtrics panel was used to obtain a U.S. sample comparable to the Head Start one. Each member in the Qualtrics panel received an invitation to participate. Still, only those who indicated their interest and passed the eligibility screening questions could access and complete the online survey. To identify and resolve any problems with the screening and survey questions, an assigned Qualtrics project manager conducted a soft launch that involved 20 participants before the start of the full-scale study. A median soft launch time was established, and an attention filter was added to exclude participants who completed the survey in only one third of the median time. This strategy helped remove participants who failed to respond to the survey thoughtfully. Incentives for participation were determined and distributed by Qualtrics based on a fixed

rate and not by the researchers. A separate consent form for the Qualtrics panel participants stated, "You will be compensated by Qualtrics for completing the online survey." All participants in the Qualtrics panel are familiar with the compensation procedure and rules of participation set by Qualtrics. The survey—which was identical to the one completed by the parents from the Head Start organizations from June to November 2020—was administered in October and November 2020 and completed by 1,370 participants. Based on the screening questions, 355 (25.9%) were eligible to participate. Based on the responses of 223 (62.8%) eligible participants who completed the study, 14 had to be excluded: One was 98 years old, and 13 did not have a 3- to 5-year-old child.

Measures

Parents' demographic characteristics were assessed. To determine parents' mental well-being, their levels of stress, anxiety, and depression were measured. To assess parents' lifestyle behaviors, their sleep, screen time, PA, and dietary intake were examined. In addition, children's lifestyle behaviors, including sleep time, screen time, PA, and fruit/vegetable intake, were assessed.

Demographic Characteristics A demographic survey developed by one of the investigators was used. Parents responded to questions about their age, gender, ethnicity, race, marital status, annual family income, employment, educational level, and number of children.

Parental Stress The Perceived Stress Scale (PSS; Cohen et al., 1983), which includes 10 items with five response choices (*never, almost never, sometimes, fairly often, and very often*), was employed. The 10-item PSS was found to have better reliability and validity than the 14-item PSS (Lee, 2012). Scores for each item were summed. A higher scale score indicates a greater level of stress. Based on the scale's sum score, three groups of participants were formed:

1. low stress (score: 0-13),
2. moderate stress (score: 14-26), and
3. high stress (score: 27-40).

In this study, the scale had a Cronbach's alpha of .82.

Parental Anxiety The eight-item, five-Likert Neurology Quality-of-Life (Neuro-QoL) Anxiety Short Form (National Institute of Neurological Disorders and Stroke [NINDS], 2015) was used. The scale has five response choices (*never, almost never, sometimes, fairly often, and very often*). Acceptable internal consistency reliability with a Cronbach's alpha of .94, test-retest reliability of .81, convergent validity, and known-group validity have been reported (Cella et al., 2012; Victorson et al., 2014). A calculated total raw scale score was transformed to a *T* score (mean = 50, *SD* = 10). Higher *T* scores indicate greater anxiety levels. A *T* score of 40 is 1 *SD* lower than the average referenced population (NINDS, 2015). In this study, the scale had a Cronbach's alpha of .93.

Parental Depression Parents responded to the Neuro-QoL Depression Short Form (NINDS, 2015). The eight-item Neuro-QoL Depression Short Form has five response choices (*never, almost never, sometimes, fairly often, and very often*). Acceptable internal consistency reliability with a Cronbach's alpha of .96, test-retest reliability of .82, convergent validity, and known-group validity in adult populations have been reported (Cella et al., 2012; Victorson et al., 2014). A calculated total raw scale score was changed to a *T* score (mean = 50, *SD* = 10). Higher *T* scores indicate greater levels of depression. A *T* score of 60 is 1 *SD* higher than the averaged referenced population (NINDS, 2015). In the current study, a Cronbach's alpha of .95 was noted.

Parental Sleep Parental sleep time (hours per day) was assessed with the following single fill-in question from the Behavioral Risk Factor Surveillance System Questionnaire: "On average, how many hours of sleep do you get in a 24-hour period?" (Centers for Disease Control and Prevention [CDC], 2020a; Stein et al., 1993). The eight-item PROMIS Sleep Disturbance Short Form (Yu et al., 2012), which is highly correlated (coefficients range from .96 to .98) with the full-item banks, was employed to assess *parental sleep disturbance (impairment)* in the past 7 days. Parents responded to a 5-point Likert scale to report about their quantity and quality sleep, as well as difficulty falling or staying asleep (Yu et al., 2012). A calculated raw scale sum score was converted to a *T* score (mean = 50, *SD* = 10). Higher *T* scores indicate greater levels of sleep disturbance. Based on the *T* score, the following four groups of parents were formed to reflect levels of sleep disturbance: none to slight (<55), mild (55-59.9), moderate (60-69.9), and severe (≥ 70). In this study, Cronbach's alpha for the short form was .89.

Parental Screen Time Parental screen time (hours per day) was measured with the following single fill-in question adapted from the National Health and Nutrition Examination Survey (NHANES)-PA and Physical Fitness Survey: "Over the past 30 days, on average how many HOURS per day did you sit and watch TV or videos, play video or computer games or use a computer for something that is not work (Count time spent playing games, watching videos, texting, or using social media on your smartphone, computer, gaming console, iPad, or other tablet.?" (CDC, 2020b).

Parental PA Parents responded to the seven-item International PA Questionnaire (Craig et al., 2003). Good test-retest reliability of .76 has been noted. Criterion-related validity (.30) assessed with accelerometer-measured PA has been established (Craig et al., 2003). Although the correlation is low, Craig et al. (2003) stated that the correlation is comparable to most other self-report validation studies and indicated that it is acceptable. Based on the multiples of the resting metabolic rate, three groups of parents were formed: inactive, minimally active, and health-enhancing physically active. In this study, the scale's Cronbach's alpha was .64.

Parental Dietary Intake To assess parental dietary intake, the Block Fruit-Vegetable-Fiber Screener was used (Block et al., 2000). Correlations between the 10-item screener and full-length survey with 100 items were acceptable (.60–.70). The screener was used to determine the number of servings of fruits and vegetables consumed daily. In this study, Cronbach's alpha for the screener was .79.

Child Sleep Time Parents answered the following single fill-in question from the Behavioral Risk Factor Surveillance System Questionnaire about their child's sleep time (hours/day): "On average, how many hours of sleep does your preschool child get in a 24-hour period?" (CDC, 2020a; Stein et al., 1993).

Child Screen Time Parents responded to the following fill-in question about their child's screen time (hours/day) that was adapted from the NHANES-PA and Physical Fitness Survey: "Over the past 30 days, on average how many HOURS per day did your preschool child sit and watch TV or videos, or play video or computer games?" (CDC, 2020b).

Child PA The following question from the NHANES-PA and Physical Fitness Survey was completed by parents to provide information about their child's PA: "During the past 7 days, how many days was your preschool child physically active for a total of at least 60 minutes per day?" Eight response choices ranged from 0 to 7 days (CDC, 2020b).

Child Fruit/Vegetable Intake Parents answered one question about their child's fruit intake and another about their child's vegetable intake. Both were adapted from the National Institute of Health Eating at American's Table Study All-Day Screener (National Cancer Institute, n.d.). The following 10 response choices are associated with each question: never (0), 1–3 times per month (0.067), 1–2 times per week (0.214), 3–4 times per week (0.5), 5–6 times per week (0.786), 1 time per day (1), 2 times per day (2), 3 times per day (3), 4 times per day (4), and 5 or more times per day (5). A Cronbach's alpha of .81 was noted for the two questions in the current study.

Data Analysis

All analyses were performed using IBM SPSS Statistics for Windows, Version 26. Descriptive statistics, including means, standard deviations, ranges, frequencies, and percentages, were calculated to describe participants' demographic factors, lifestyle behaviors, and mental well-being. Pearson correlations were used to examine the bivariate correlations among lifestyle behaviors and parents' mental well-being. Multivariate general linear model was applied to explore the relationship of parents' and children's lifestyle behaviors (sleep, screen time, PA, and fruit/vegetable intake) with parental stress, anxiety, and depression after controlling for all demographic factors, including parents' age, number of children, gender, ethnicity, race, marital status, education level, employment status,

and annual family income. R^2 was reported to indicate the variances in parents' mental well-being explained by demographics and lifestyle behaviors. Sensitivity analyses were conducted to examine the robustness of the results across the two samples. Results with a p value of $<.05$ were statistically significant.

RESULTS

Demographics

A total of 408 parents (mean age = 31.1 years, 87.3% women) completed the survey. Each family had an average of two children. Among participating parents, 16.7% were Hispanic and 21.1% were Black. Slightly over half were married/partnered, 36.3% were single, and 42.6% had an annual family income of $< \$20,000$. About 43.6% were unemployed, 38.7% had a high school education or lower, 34.3% had some college, 12.5% had a technical school or community college degree, and 14.5% had at least a bachelor's degree. Table 1 displays participants' demographic characteristics.

TABLE 1. Participants' Demographic Characteristics (N = 408)

Demographics	M/n	SD/%
Age	31.10	7.25
No. of children	2.38	1.30
Gender of parent (female)	356	87.3%
Missing	1	0.2%
Ethnicity (Hispanic)	68	16.7%
Missing	1	0.2%
Race		
White	250	61.3%
Black	86	21.1%
Mixed/other	72	17.6%
Marital status		
Married/partnered	207	50.7%
Separated/divorced/widowed	53	13.0%
Single	148	36.3%
Annual income		
$< \$20,000$	174	42.6%
$\$20,000$ – $29,999$	112	27.5%
$\$30,000$ – $49,999$	97	23.8%
$\geq \$50,000$	25	6.1%
Employment		
Full time	133	32.6%
Part time	94	23.1%
Not employed	178	43.6%
Missing	3	0.7%
Education		
\leq High school	158	38.7%
Some college	140	34.3%
Technical school or community college degree	51	12.5%
\geq Bachelor's degree	59	14.5%

Parents' Mental Well-Being

Approximately 13.5% ($n = 55$) of the parents reported a low level of stress, 69.4% ($n = 283$) reported a moderate level of stress, and 17.2% ($n = 70$) reported a high level of stress. Parents had a mean anxiety T score of 57.26 ($SD = 7.35$; minimum-maximum, 36.4-76.8) and a mean depression T score of 52.76 ($SD = 8.61$; minimum-maximum, 36.9-75). After adjusting for both parents' and children's lifestyle behaviors and other demographic factors, the number of children in households was negatively correlated with parents' anxiety level ($B = -0.67, p = .009$). Black parents reported having the lowest level of depression compared to White or other racial parents ($B = -3.42, p = .001$).

Parents' Lifestyle Behaviors and Their Mental Well-Being

On average, parents slept for 7.04 hours ($SD = 7.83$) per day, and 52% ($n = 212$) slept at least 7 hours per day. Approximately 18.6% ($n = 76$), 16.9% ($n = 69$), 38.2% ($n = 156$), and 26.2% ($n = 107$) had none to slight, mild, moderate, and severe sleep disturbance, respectively. Parents reported having an average of 6.99 hours ($SD = 5.97$) of screen time per day. Around 32.8% ($n = 134$) of the parents were inactive, 49.8% ($n = 203$) were minimally active, and 17.2% ($n = 70$) were health-enhancing physically active. Parents consumed a mean of 3.53 servings ($SD = 2.08$) of fruits/vegetables per day, and 20.6% ($n = 84$) had at least five servings per day.

As shown in Table 2, parents' sleep disturbance was positively correlated with their own levels of stress ($r = .53, p < .001$), anxiety ($r = .48, p < .001$), and depression ($r = .46, p < .001$). Similarly, parents' screen time was positively correlated with their levels of anxiety ($r = .10, p = .045$) and depression ($r = .11, p = .029$). Moreover, parents' level of stress was negatively correlated with their own sleep time ($r = -.13, p = .010$) and fruit/vegetable intake ($r = -.16, p = .001$). After

adjusting for parents' demographic characteristics and children's lifestyle behaviors, parents' sleep disturbance was still positively correlated with their levels of stress ($B = 0.31, p < .001$), anxiety ($B = 0.34, p < .001$), and depression ($B = .40, p < .001$; see Table 3).

Children's Lifestyle Behaviors and Parents' Mental Well-Being

Children were reported by their parents as being active for about 5 days ($SD = 2.13$) per week, and 41.4% ($n = 169$) were active 7 days a week. Children, on average, slept for 9.17 hours ($SD = 2.61$) per day, and 41.2% ($n = 168$) slept for at least 10 hours per day. Moreover, children spent a mean of 4.84 hours ($SD = 4.93$) per day in front of a screen, and 33.1% ($n = 135$) had screen time of 2 hours or less. Children consumed an average of 2.41 servings ($SD = 2.16$) of fruits/vegetables per day, and 19.6% ($n = 80$) consumed at least five servings per day.

Child fruit/vegetable intake was positively correlated with their parents' levels of stress ($r = .10, p = .040$), whereas child screen time was positively related to parents' anxiety level ($r = .10, p = .044$). However, after controlling for parents' demographic characteristics and lifestyle behaviors, child fruit/vegetable intake and screen time were no longer significantly related to parents' mental well-being. Instead, child sleep time was negatively associated with parents' stress level ($B = -0.27, p = .025$).

Sensitivity Analyses and Explained Variances

Results from sensitivity analyses consistently showed that parents' sleep disturbance was related to their levels of stress, anxiety, and depression across the two study samples. For the Head Start sample, parents' fruit/vegetable intake was still negatively related to their stress level ($B = -0.62, p = .016$) after

TABLE 2. Bivariate Correlations Among Lifestyle Behaviors and Parents' Mental Well-Being (N = 408)

Variable	P-sleep time	P-sleep disturbance	P-screen time	P-physical activity	P-F/V intake	C-sleep time	C-screen time	C-physical activity	C-F/V intake	Stress	Anxiety
P-sleep disturbance	-.30**										
P-screen time	.17**	.02									
P-physical activity	-.11*	.04	-.03								
P-F/V intake	.02	-.17**	-.06	.09							
C-sleep time	.20**	-.07	.03	-.03	.08						
C-screen time	.14**	.02	.27**	.01	.05	.11*					
C-physical activity	-.21**	.10	-.11*	.16**	.10	.14**	-.21**				
C-F/V intake	-.18**	.14**	-.04	.11*	.23**	.09	-.07	.26**			
Stress	-.13*	.53**	.03	-.01	-.16**	-.09	.07	.04	.10*		
Anxiety	-.07	.48**	.10*	.03	-.06	-.04	.10*	.02	.03	.74**	
Depression	-.06	.46**	.11*	-.01	-.07	-.08	.09	-.05	-.02	.71**	.77**

Note. P = parent; C = child; F/V = fruit/vegetable.

* $p < .05$.

** $p < .01$.

TABLE 3. Influence of Lifestyle Behaviors on Parents' Mental Well-Being (N = 408)

Predictor	Stress			Anxiety			Depression		
	B	SE	p	B	SE	p	B	SE	p
Intercept	3.62	3.06	.238	38.86	3.55	<.001	32.75	4.27	<.001
Age	0	0.04	.991	0.01	0.05	.780	-0.01	0.06	.812
No. of children	-0.26	0.22	.243	-0.67	0.26	.009	-0.51	0.31	.097
Gender (male)	-0.39	0.88	.663	-1.44	1.02	.160	-0.28	1.23	.821
Ethnicity (Hispanic)	-0.95	0.79	.231	-0.12	0.91	.898	-0.19	1.10	.860
Race (reference: White)									
Black	-1.01	0.75	.177	-1.47	0.87	.090	-3.42	1.04	.001
Mixed/other race	-0.94	0.80	.237	-0.66	0.92	.475	-1.68	1.11	.130
Marital status (separated/single)	-0.98	0.61	.105	-0.72	0.70	.303	0.10	0.85	.904
Education (reference: ≥ community college degree)									
≤ High school education	0.33	0.74	.652	-0.58	0.86	.504	0.16	1.03	.876
Some college	0.64	0.72	.374	-0.80	0.83	.339	-0.27	1.00	.791
Employment (reference: full time)									
Not employed	0.82	0.71	.244	0.96	0.82	.242	-0.13	0.98	.895
Part time	1.20	0.77	.119	0.58	0.89	.514	-0.04	1.07	.970
Family income (<\$20,000)	-0.77	0.66	.238	-1.93	0.76	.011	-1.24	0.91	.175
P-sleep time	0.09	0.12	.435	0.10	0.13	.455	0.17	0.16	.303
P-sleep disturbance	0.31	0.03	<.001	0.34	0.03	<.001	0.40	0.04	<.001
P-screen time	-0.01	0.05	.871	0.08	0.06	.190	0.07	0.07	.292
P-physical activity	-4.24E-5	8.51E-5	.619	3.53E-5	9.86E-5	.720	-6.97E-5	0	.558
P-F/V intake	-0.25	0.15	.081	0.09	0.17	.596	0.19	0.20	.342
C-sleep time	-0.27	0.12	.025	-0.18	0.14	.192	-0.29	0.16	.083
C-screen time	0.10	0.06	.092	0.09	0.07	.223	0.08	0.09	.340
C-physical activity	0.04	0.14	.796	-0.05	0.17	.753	-0.27	0.20	.180
C-F/V intake	0.24	0.14	.086	0.01	0.16	.969	-0.12	0.19	.541
R ²			.334			.298			.281

Note. P = parents; C = children; F/V = fruits and vegetables.

adjusting for demographics and other behaviors. For the total sample, parents' demographic characteristics, lifestyle behaviors, and children's lifestyle behavior together explained about 33.4%, 29.8%, and 28.1% of the variance in parents' levels of stress, anxiety, and depression, respectively. The stress variances were similar across the two study samples (Head Start: 35.6%; Qualtrics panel: 36.0%). For the anxiety and depression outcomes, the models explained slightly greater variances in the Head Start sample than in the Qualtrics panel sample (Head Start: 41.8%, 34.4%; Qualtrics panel: 22.5%, 23.4%).

DISCUSSION

To the best of our knowledge, this study is the first to examine multiple lifestyle behaviors (sleep, PA, screen time, and eating behavior) of low-income, racially/ethnically diverse parents and their preschool children and their relationships with parents' stress, anxiety, and depression during COVID-19. Knowledge in this area is essential for developing effective interventions to promote parents' and children's healthy lifestyle behaviors and parents' mental well-being both during and after a pandemic.

Over three fifths of the parents had moderate or severe sleep disturbance. Consistent with findings from previous

studies conducted with adults during COVID-19 (Cellini et al., 2020; Stanton et al., 2020), greater sleep disturbance was associated with higher levels of stress, anxiety, and depression. Similar findings were noted among U.S. parents having 5- to 18-year-old children, showing that lower perceived sleep quality was significantly correlated with higher levels of parenting- and health-related stress (Peltz et al., 2020). One plausible explanation for these consistent results is that sleep disturbance may alter the circadian rhythm and leave parents with less energy and more difficulty responding to challenging situations, possibly contributing to increased stress or mental health issues. Experiencing stress is then likely to activate cortisol secretion to support the body's response to stressors (Peltz et al., 2020).

About one fifth of the parents met World Health Organization (2003) recommendations calling for ≥5 fruits/vegetables a day. The finding that lower fruit/vegetable intake was no longer associated with increased levels of parents' stress during COVID-19 after adjusting for parents' demographic characteristics and children's lifestyle behaviors was not anticipated. In a U.S. survey of low-income families with children (<18 years old), slightly >41% of the respondents

reported that their fruit/vegetable intake decreased because of the pandemic. The respondents also noted that the reduced availability of produce, rising produce prices, and little money for healthy foods increased their stress levels (Sharma et al., 2020). As a result of having a high consumption of unhealthy, nutrient-deficient processed foods (Sharma et al., 2020), low-income parents may be disproportionately at risk for chronic conditions and particularly in need of strategies to boost fruit/vegetable intake, especially during a pandemic (Litton & Beavers, 2021).

Similarly, relationships between parents' screen time and their levels of anxiety and depression were not significant anymore after adjusting for demographics and other behaviors. The current study's findings conflicted with those of a larger U.S. study, the latter of which showed that adults who increased their screen time during COVID-19 had higher levels of stress and depressive symptoms than those who maintained a low level of screen time (Meyer, McDowell, et al., 2020). Possibly, the discrepancies resulted from demographic, analysis, or measurement differences between the studies. For example, the previous study did not adjust sleep or eating behaviors in the models. Also, the screen time measure completed by the low-income parents in the current study focused on only non-work-related screen time, whereas the one used with the adults (mainly college educated and/or employed) in the other study also included work-related screen time (Meyer, McDowell, et al., 2020). Another plausible explanation is that screen time may be used as a temporary but effective coping strategy for parents with young children to help manage their children's behavioral problems or mental issues and give parents some personal quiet time. Although this approach may reduce parental stress during a pandemic, more effective coping strategies are needed. Research using similar reliable and valid measures with diverse samples is also necessary to address the mixed evidence to date regarding the effect of screen time on mental health (Meyer, McDowell, et al., 2020).

In contrast to screen time, research on PA consistently shows that health benefits, including reduced feelings of anxiety and risk of depression, can be reaped by adults who engage in ≥ 150 minutes a week of at least moderate intensity PA (U.S. Department of Health and Human Services, 2018). Unfortunately, less than one fifth of the low-income parents could attain enough PA to enhance health during COVID-19, as compared to greater than two thirds of a large U.S. sample of predominately college-educated adults during the same period (Meyer, Herring, et al., 2020). Counter to evidence supporting a positive association between PA and mental health (Meyer, McDowell, et al., 2020), the current study showed no relationship between this behavior and stress, anxiety, or depression. In a study conducted during the pandemic that included adults residing in the United States, neighborhoods with higher poverty were more likely than those with lower poverty to have less social cohesion and greater crime, both of which were related to lower PA and higher odds of depression and anxiety.

When compared with low levels of PA, moderate PA, but not high, was associated with lower odds of depression and anxiety (Yang & Xiang, 2021). This information suggests that complicated pathways, including other factors, may have interfered with the emergence of a significant association of PA with mental health among low-income parents in the current study.

When relationships between children's lifestyle behaviors and parents' mental well-being were examined, greater sleep time among children was associated with lower levels of parental stress after adjusting for demographics and parents' behaviors. Similar findings were noted in a pre-pandemic study conducted in the United States with low-income mothers of minority preschool children that showed preschoolers' lower sleep duration assessed via wrist accelerometers was related to higher life stress among the mothers. One possible explanation is that children who are not sleeping adequately, especially if they are awakening during the night, may negatively affect their parents' sleep and contribute to increased parental stress. In addition, the negative relationship between preschoolers' sleep duration and parents' stress may be due to parents' difficulties with managing their child's bedtime (Caldwell & Redeker, 2015). In the current study, close to three fifths of the preschoolers did not meet the U.S. National Sleep Foundation (Hirshkowitz et al., 2015) recommendation for this age group of 10–13 hours every 24 hours. Minority preschool children who live at or below the poverty level are at greater risk than other children for sleep problems and inadequate sleep time (El-Sheikh et al., 2007). According to Caldwell and Redeker (2015), low-income parents may benefit from education on strategies to reduce bedtime challenges. Some recommendations include adhering to a specific rise and sleep time, the same quiet sleep location, and a consistent routine to nurture the child right before bedtime (e.g., reading a book). In addition, the American Academy of Pediatrics recommends ending screen time viewing at least 1 hour before bedtime (Council on Communications and Media, 2016). In the current study, the preschooler sleep time was positively related to parent sleep time, indicating that family-based programs targeting the whole family system to promote better sleep quality overall may be needed during and beyond a pandemic.

Most of the preschoolers did not meet recommendations calling for <2 hours of screen time per day (Council on Communications and Media, 2016), regular PA throughout every day (U.S. Department of Health and Human Services, 2018), and consumption of an adequate number of servings of fruits/vegetables per day (Grimm et al., 2014), consistent with several reports of negative effects from COVID-19 on these behaviors (McCormack et al., 2020; Sharma et al., 2020). The current study's findings showed that preschoolers' screen time and fruit/vegetable intake were no longer significantly related to parents' mental well-being after controlling for parents' demographics and lifestyle behaviors. Similarly, after adjusting for covariates, another study conducted during

COVID-19, but with parents of school-aged children, showed no association between parents' anxiety and their children's time watching television (McCormack et al., 2020). Also, in a study with low-income parents of minority preschoolers conducted before COVID-19, no relationship emerged between parents' depressive symptoms and the children's diet and PA (Heerman et al., 2017). Taken together, these findings suggest that other factors may be influencing relationships between these health-promoting behaviors of children and their parents' mental well-being.

Limitations

Some limitations warrant consideration. The sample was not representative of the U.S. population in general because only families who probably needed assistance during the pandemic were included. Employing objective measures, such as actigraphy for PA or sleep and polysomnography for sleep, could provide greater reliability for assessing these behaviors (De Stasio et al., 2020). The cross-sectional design precludes drawing any conclusions to support any cause-and-effect relationship. Also, given the low-income status of the families, the lack of effect of child fruit/vegetable intake and PA levels on parents' mental well-being may have simply reflected a continuation of pre-COVID-19 patterns with no worsening of them because of COVID-19 circumstances.

Moreover, except for sleep disturbance ($r = .46-.53$), other lifestyle behaviors only had small relationships ($r = .10-.29$) with parents' mental well-being, and the variances explained ranged from 0.281 to 0.334, indicating that large variability was not accounted for by the variables measured in this study. However, the variances explained were larger than a study with general U.S. adults (20%–27%; Meyer, McDowell, et al., 2020). The findings may be due to other unmeasured confounders such as the social environment, parent-child relationship, uncertainty of the pandemic, and life; therefore, interpretation of the current study's results requires caution.

Conclusion

The findings indicate that most low-income parents and their preschool children were not meeting many lifestyle behavior recommendations. Improving parents' sleep quality and reducing bedtime challenges involving their preschoolers may be particularly important for enhancing parental mental well-being. Until the pandemic's negative effect on families ceases and possibly beyond this period, low-income parents and their preschoolers will need support to increase and maintain their healthy behaviors, which may ultimately contribute to enhancements in parental mental well-being.

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