COVID-19 hardships and self-reported sleep quality among American adults in March and April 2020: Results from a nationally representative panel study

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ABSTRACT

Objective: To analyze the association between coronavirus disease 2019 (COVID-19) hardships and self-reported sleep troubles in a nationally representative sample of adults in the United States.

Design: Prospective study in March and April 2020.

Setting: Population-based.

Participants: About 8130 respondents who participated in the Pew Research Center’s American Trends Panel in March and April of 2020.

Measurements: Self-reported sleep troubles were defined as a report of 3 or more days per week with trouble sleeping in March and April (separately). Respondents were asked about COVID-19 stressors such as COVID-19 threat and COVID-19-specific hardships including pay cuts/hours reductions, job loss, and childcare difficulties. Logistic regression models were fit to test associations between COVID-19 hardships and sleep troubles adjusted for sociodemographic covariates (age, gender, race/ethnicity, region, marital status, nativity, education, income, health insurance, and past diagnosis of mental health problems).

Results: Reported sleep troubles increased from March (29.0%) to April (31.4%). For March, we found that COVID threat, losing a job, getting a pay cut, and difficulty with childcare were separately associated with sleep troubles. In April, COVID-19 threat and difficulty with childcare, but not losing a job or getting a pay cut were associated with sleep troubles even after additionally accounting for reported sleep troubles in March.

Conclusions: We found that COVID-19-specific stressors, especially a broad measure of COVID-19 Threat and stress over childcare, were associated with sleep troubles in March and April. These findings identified novel stressors related to COVID-19, which may affect the sleep of the American population.

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Introduction

Despite ongoing policy initiatives, the coronavirus disease 2019 (COVID-19) outbreak represents a significant crisis in the United States. Data from the Centers for Disease Control and Prevention indicate that the coronavirus outbreak is responsible for more than 45 million infections and over 700,000 deaths in the United States. The deaths and long term health implications may just represent the “tip of the iceberg” of the societal influence of the COVID-19 outbreak, which led to an economic collapse, increase in mental health problems, and dramatically restructured numerous aspects of society. The rapid and dramatic societal modifications were especially novel and abrupt for many Americans in the Spring of 2020 when United States began a voluntary national shutdown in response to the spread of the COVID-19. This voluntary shutdown, in turn, led to considerable alterations to daily life and increases in novel forms of stress. Here, we analyzed the importance of COVID-19-specific stressors and their association with self-reported sleep troubles in the Spring of 2020.

A growing number of researchers have investigated whether these abrupt pandemic-related modifications to society broadly and social behaviors specifically altered secular sleep patterns. For instance, drawing on data from an Amazon Mechanical Turk (MTURK) sample (n = 699), one study examined changes in sleep quality before (mid-February 2020) and during (late March) the national shutdown. Results from this study indicated that sleep quality was relatively unchanged (or even improved) in the early
quarantine periods. However, they also found that those who experienced higher levels of COVID-19 adversity and stress experienced worse sleep quality than those who had less exposure and that participants recalled their pre-pandemic sleep as better than it actually was. Using a cross-sectional telemedicine sample (n = 365, mean age 63.9), Pinto and colleagues found that specific populations in Portugal were at higher risk of decreasing sleep quality (e.g., those that were confined to home without work and females) than other parts of the population. One study utilizing on a cross-sectional representative sample in France (n = 1005) found a large increase in sleep troubles after 2 weeks of confinement (late March and Early April of 2020), especially among women and young people. However, a study based on 4 cross-sectional representative surveys in France indicated that sleep problems decreased from March until June of 2020. Gupta and colleagues used a survey distributed on social media (n = 958) found that the COVID-19 shutdown was associated with poorer sleep quality, shifts in sleep cycle to delayed phase, and sleep-deprivation based on nighttime sleep among adults in India. Other scholars examined links between COVID-19-related stressors and sleep quality among university students (n = 307) and administrators (n = 93) in Italy and found increases in insomnia, or difficulty initiating or maintaining sleep, from late March to May 2020. Thus, recent evidence generally suggests that COVID-19 negatively influenced sleep quality in particular, and this is likely due to increasing levels of COVID-19-related stressors.

Although these and other studies continue to make significant contributions to our understanding of the sleep-health-related consequences of the COVID-19 outbreak, relatively less is known about how specific novel COVID-19-related stressors (i.e., perceived COVID-19 threat, job loss specifically due to COVID-19, pay cuts specifically due to COVID-19, and increasing burdens of childcare due to COVID-19) influence sleep patterns among adults in the United States. Identifying which COVID-19-specific stressors may have led to decreasing sleep quality allows policy makers and clinicians to best address a potentially emerging sleep crisis. This is especially true in March and April of 2020 when the threat and implications of COVID-19 was abruptly understood by the population and a nation-wide lockdown was in effect, making it a critical time to understand the implications of COVID-19-specific stressors for sleep. Indeed, it remains critically important to understand the association between COVID-19 stressors and sleep given there is increasing evidence that stress is linked with poor sleep and because poor sleep is adversely linked to a range of health (i.e., immune functioning, preventing and developing COVID-19, and long-term health outcomes) and other outcomes (e.g., parenting and job performance). The present study builds on past research regarding how COVID-19 may alter sleep by explicitly identifying whether multiple COVID-19-specific stressors independently and collectively influence sleep among US adults. More specifically, we contribute to research on COVID-19-specific stressors and sleep in the following 3 ways. First, most research regarding the association between COVID-19-related outcomes and sleep has addressed the unique challenges of data collection during the COVID-19 outbreak by utilizing surveys from a range of sources and/or by focusing on specific populations. In contrast, the present study draws on data from a range of sources and/or by focusing on selection during the COVID-19 outbreak by utilizing surveys from a population-based panel study of adults in the United States that continued to be conducted after the US lockdown and we use the study to assess how COVID-19-related stressors shaped sleep troubles. Second, in contrast to most research on this topic, our study documents the association between a range of COVID-19-related stressors and how they influence sleep. Rather than focus on one specific domain of COVID-19-related stress exposure we analyzed how distinct and unique domains of COVID-19-related stressors (i.e., job loss due to COVID-19, pay cuts due to COVID-19, childcare changes due to COVID-19, and perceived COVID-19 threat) were related to sleep problems independently and collectively and utilized cross-sectional and longitudinal data while controlling for important baseline sociodemographic characteristics. Finally, given that socially disadvantaged groups are disproportionally affected by the COVID-19 outbreak, we tested whether the influence of stress exposure related to the COVID-19 outbreak on sleep varies by gender and ethno-racial groups.

Participants and methods

Data

Data for this investigation came from the Pew Research Center’s American Trends Panel (ATP), a population-based online panel survey of non-institutionalized adults aged 18+ in the United States. Respondents participated in the panel via monthly self-administered web surveys. The survey has been collecting data on Americans and their views since 2014. To enhance external validity, the Pew Research Center provided a tablet and internet access to respondents who lacked internet access. More detailed information about the ATP including information regarding informed consent is discussed elsewhere. We rely on de-identified publicly available data for this study. Given this, we did not seek IRB approval as this form of data is exempt from IRB approval.

The ATP is increasing utilized in health-related research and has continued data collection during the early stages of the COVID-19 pandemic and lockdown. We used 3 waves of COVID-19 data from the ATP. In Wave 63.5 (mid-March, 2020), the ATP asked panelists to complete detailed questions regarding their views of the COVID-19 outbreak. Subsequently, the ATP included questions regarding trouble sleeping in Wave 64 (late March 2020) and Wave 66 (late April 2020). We analyzed respondents who had valid sample weights for Waves 63.5-66 and measures of sleep leading to a total analytic sample of 8130 respondents. Substantive results were quite similar when a sample without valid weights was analyzed (n = 9189) and when the analysis was not weighted, please see Supplemental Table 1 for more information.

Measures

Sleep Problems. In late March (Wave 64) and late April (Wave 66), respondents were asked: “In the past 7 days, how often have you had trouble sleeping?” Respondents could answer: “rarely or none of the time,” “some or a little of the time (1-2 days),” “occasionally or a moderate amount of the time (3 or more days),” and “most or all of the time (5-7 days).” Past research aimed at quantitatively diagnosing insomnia symptoms has concluded that 3 or more nights per week with difficulty or troubles sleep was the best quantitative specification for an insomnia diagnosis. Indeed, past researchers and clinicians who have examined slightly different measures of reported sleep quality (e.g., trouble falling asleep) have employed a dichotomous specification where those who report trouble or difficulty/trouble sleeping 3+ days per-week were compared to those with less than 3. Thus, we followed the diagnosis guidelines and previous research and dichotomized the outcome at both waves so that those who reported “rarely or none of the time” or “some to a little of the time” with trouble falling asleep were coded “0” and those who reported “occasionally or a moderate amount of the time” or “most or all of the time” with trouble falling asleep were coded “1” (hereafter: “sleep troubles” or “trouble sleeping”). In addition, we analyzed a continuous specification where we fit a regression model predicting the assumed midpoint value of each possible response; the results are presented in Supplemental Table 1. Results from the dichotomous (in the text) and continuous specification (in the supplement) were quite similar. However, the results from the dichotomous
specification are more conservative, based on research, and involve less assumptions, thus they are presented throughout the text.

Perceived COVID-19 threat and hardships

Participants were asked (in Wave 63.5) whether they felt that the coronavirus was a threat to "the health of the US population as a whole," their "personal health," "the US economy," their "personal financial situation," and their "day-to-day life." Responses included "a major threat" (1), "minor threat" (2), and "not a threat" (3). Responses were reverse coded, reset to zero, and summed so that higher values correspond with higher threat levels (possible range: 0-10; Cronbach's $\alpha = 0.78$). This measure has been used in other recent research and was associated with psychological distress among Black adults, suggesting construct validity.\(^{32}\) In Wave 64 (late March), the respondents were asked if they or someone in their household had been laid off or lost a job due to the coronavirus outbreak and were also asked if they or someone in their household had to take a pay cut or decreased hours due to coronavirus outbreak (both questions were coded "1" if yes and "0" if otherwise). To account for shifts in childcare due to COVID-19, we combined 2 childcare-related questions into a categorical variable. First, respondents were asked if they had children under the age of 12 in their household; respondents without children under the age of 12 in their households were coded as the reference group for the combined childcare care variable. Next, respondents who indicated that they had children under the age of 12 in their households were asked how difficult it has been to handle childcare responsibilities during the coronavirus outbreak. Response categories for this question were "very easy" (1), "somewhat easy" (2), "somewhat difficult" (3), or "very difficult" (4). We conducted additional sensitivity analyses on the childcare question coding and analyzed only parents, the results of these analyses were similar to the overall analysis and more information can be found in the Supplemental Materials.

Covariates

Our study accounted for important covariates. Demographic characteristics included age (18-29 (ref), 30-49, 50-64, and 65 and older), region (South (ref), Northeast, Midwest, and West), and gender (1 = male, 0 = female). Marital status was dummy coded (1 = currently married, 0 = otherwise). We coded race/ethnicity as non-Latino white adults (ref), non-Latino Black adults, Latino adults, and other race adults. We also accounted for nativity status as a categorical variable based on where they were born: United States (ref), Puerto Rico, other US territory, Cuba, Mexico, another country. Socioeconomic indicators included educational attainment (high school graduate or less (ref), some college, and college graduate) and household income ($75,000 and above, $30,000-$74,999, and less than $30,000 (ref)). We also created dummy variables for health insurance coverage (1 = insured, 0 otherwise) and prior mental health diagnosis (1 = prior mental health diagnosis, 0 otherwise).

Analytic procedures

We first calculated descriptive statistics for the analytic sample. We then fit a series of logistic regression models predicting self-reports of sleep troubles.\(^{33}\) In the first set of models, we predicted sleep troubles at Wave 64 (late March) based on the COVID-19 stressor measures. We fit a model for each of the 4 measures of COVID-19 hardship (4 models) with all the covariates and then fit a model with all the measures of COVID-19 hardship and covariates to test the independent effects. Next, we employed a similar procedure but predicted reports of sleep troubles at Wave 66 (late April), allowing us to analyze whether COVID-hardships in March were associated with sleep troubles in late April. In the models predicting sleep problems at Wave 66 (late April), we additionally accounted for reported sleep troubles in March to analyze if the association between COVID-19 hardships and sleep troubles remained significant even after adjusting for previously reported sleep troubles. Finally, we fit interaction terms to investigate if there were gender and race/ethnic differences in the association between COVID-19 hardships and sleep problems. All analyses were conducted in Stata 15.0 and weighted to account for the ATP complex sampling design. Unweighted analyses provided similar substantive results, please see Supplemental Table 1. Missing data were handled with Stata's multiple imputation suite \((\text{mi impute})\). This imputation suite used chained equations to create ten imputed datasets, which were then combined \((\text{mi estimate})\).\(^{34}\) Listwise deletion also provided similar overall results, please see Supplemental Table 1.

Results

Table 1 presents descriptive statistics of the sample. These results suggest that sleep troubles did increase from Wave 64 (29.0%) to Wave 66 (31.4%) and this increase was significant as measured by a proportion t-test. The mean perceived COVID-19 threat scale score was 6.50 (higher scores indicate higher COVID-19 threat, 10 is the maximum value). More than 16% of respondents reported they or someone in their household were laid off or fired because of COVID-19, and nearly a quarter (24.1%) reported that they or someone in their household received a pay cut or reduction in hours due to COVID-19. Although most respondents had no children under the age of 12 in their households (80.0%), among those who had children under the age of 12 in their homes, almost equal proportions of respondents indicated that childcare has been "very easy" (6.6%) or "somewhat easy" (6.3%) during COVID-19. Fewer respondents indicated that childcare has been "somewhat difficult" (5.3%) and "very difficult" (1.3%). In ancillary descriptive analyses we found that the percent of women who reported "very difficult" childcare (2.2%) was almost double that of men (1.3%). Table 1 also presents the descriptive statistics for the other covariates.

Table 2 presents findings from the logistic regressions predicting reported sleep troubles. The separate models (ie, each COVID-19 measure added individually) for Wave 64 indicated that COVID-19 threat was associated with significantly higher odds of sleep troubles (odds ratio \([\text{OR}]\): 1.13, 95% confidence interval \([\text{CI}]\) =1.10-1.15); respondents who reported higher levels of COVID-19 threat had significantly higher odds of reporting sleep troubles. Those (or someone in their household) who were laid off or fired due to COVID-19 were significantly greater odds of reporting sleep troubles \((\text{OR}: 1.20, 95\% \text{ CI} =1.05-1.36)\) than those who were not laid off or fired. Similarly, those (or someone else in their household) who had a pay cut or work hours reduced because of COVID-19 had significantly greater odds of reporting sleep troubles \((\text{OR}: 1.14, 95\% \text{ CI} =1.01-1.29)\) than those who did not have their hours or pay cut. With respect to childcare, respondents who reported that childcare during COVID-19 was either "somewhat difficult" \((\text{OR}: 1.33, 95\% \text{ CI} =1.05-1.68)\) or "very difficult" \((\text{OR}: 1.45, 95\% \text{ CI} =1.04-2.02)\) had significantly higher odds of experiencing sleep troubles than respondents who had no children under the age of 12 in their households. In the combined model for Wave 64 (where all the COVID-19 hardship measures were jointly included), perceived COVID-19 threat retained significance \((\text{OR}: 1.12, 95\% \text{ CI} = 1.10-1.15)\). Additionally, for childcare difficulties during COVID-19, the "somewhat difficult" category remained statistically significant in the combined model \((\text{OR}: 1.28, 95\% \text{ CI} = 1.01-1.62)\), but the "very difficult" category was no longer statistically significant. Furthermore, the association between those (or someone in their household) who lost their job or had their hours cut due to COVID-19 was no longer significant in the combined model for Wave 64.
The COVID-19 outbreak radically and abruptly transformed American society. Yet, the implications of these secular changes for population-level sleep patterns are only starting to be understood. Here, we used a prospective population-based sample to analyze how COVID-19 threat and specific hardships (pay cuts/hours reductions, job loss, and childcare difficulties) were associated with reporting sleep troubles in late March and April of 2020—a critical period in the pandemic.

The present study contributes to the literature on COVID-19 stressors and sleep troubles in the following ways. First, we found that the perceived COVID-19 threat scale collected in early March was significantly associated with a greater odds of trouble sleeping in late March and April of 2020. This finding persisted after adjustment of important sociodemographic (eg, race/ethnicity, age, gender, income) characteristics and other important covariates for sleep (eg, past diagnosis of mental health problems, which was a statistically significant predictor of sleep problems at both waves). The finding that COVID-19 threat scale was significantly associated with trouble sleeping in April was especially concerning given that we controlled for reported sleep troubles in March, suggesting that certain COVID-19 stressors continued to influence sleep into the Spring. This finding was consistent with a recent study on perceived COVID-19 health threat, beliefs about discrimination in medical settings, and psychological distress among Black adults. These findings are also congruent with other studies analyzing COVID-19 threat and other health outcomes including psychological distress among adults who had no prior mental health problems.

While we found that job loss and pay/hour reduction due to COVID-19 were associated with worse sleep in March, the association was explained with controls for the other COVID-19 measures such as COVID-19 threat, and the differences were not significant in April. Job loss or pay reductions may be immediately stressful, but over time may become less impactful for sleep. Indeed, the Coronavirus Aid, Relief, and Economic Security act was passed in late March and provided additional enhanced financial assistance for the unemployed that was implemented by April which may have helped buffer any financial stress. Thus, the immediate financial stressors of job loss may have waned for many by April. Sleep health remains a multidimensional concept comprised of unique dimensions of sleep. It is possible differential associations would be observed for other measures of sleep. For instance, sleep duration tends to increase with unemployment or reduced working hours. Thus, the extent to which these processes influenced other measures of sleep remains less clear and is an important area for subsequent research.

Additionally, we found that those who had difficulty adjusting to caring for their children experienced significantly higher odds of reporting sleep troubles. Importantly, this association remained significant in the models that accounted for the other COVID-19 hardship measures and remained significant in April, suggesting that stress over childcare was a unique dimension of COVID-19 threat that was independently associated with sleep troubles. While past research has suggested that stressors related to caregiving increase sleep problems, we are unaware of research that has found the increased stress from childcare due to COVID-19 was related to increased sleep problems. Additionally, past research has found that

Table 1 also presents the results from reported sleep troubles at Wave 66. The models predicting sleep troubles at Wave 66 also controlled for reported sleep troubles at Wave 64; thus, these models’ results are independent of reported sleep troubles in the prior wave (Wave 64). The individual models indicated higher COVID-19 threat remained significantly associated with self-reported sleep troubles (OR: 1.06, 95% CI = 1.03–1.08). Receiving a pay cut was also associated with higher odds of reporting sleep troubles (OR: 1.14, 95% CI = 1.00–1.29). However, in the individual models losing a job due to COVID-19 was no longer associated with poor quality sleep at Wave 66. Compared to respondents who had no children under the age of 12 in their households, respondents who reported that childcare during COVID-19 was “somewhat difficult” had significantly higher odds of reporting sleep troubles (OR: 1.41, 95% CI = 1.10–1.81). In the combined model for Wave 66, COVID-19 threat (OR: 1.05, 95% CI = 1.03–1.08) and the “somewhat difficult” (OR: 1.37, 95% CI = 1.07–1.77) category of childcare during COVID-19 remained statistically significant predictors of sleep troubles. We found no significant differences for any of the COVID-19 hardship measures by gender (Supplemental Table 2) or race/ethnicity (Supplemental Table 3).

**Discussion**

The COVID-19 outbreak radically and abruptly transformed American society. Yet, the implications of these secular changes for population-level sleep patterns are only starting to be understood. Here, we used a prospective population-based sample to analyze how COVID-19 threat and specific hardships (pay cuts/hours reductions, job loss, and childcare difficulties) were associated with reporting sleep troubles in late March and April of 2020—a critical period in the pandemic.

The present study contributes to the literature on COVID-19 stressors and sleep troubles in the following ways. First, we found that the perceived COVID-19 threat scale collected in early March was significantly associated with a greater odds of trouble sleeping in late March and April of 2020. This finding persisted after adjustment of important sociodemographic (eg, race/ethnicity, age, gender, income) characteristics and other important covariates for sleep (eg, past diagnosis of mental health problems, which was a statistically significant predictor of sleep problems at both waves). The finding that COVID-19 threat scale was significantly associated with trouble sleeping in April was especially concerning given that we controlled for reported sleep troubles in March, suggesting that certain COVID-19 stressors continued to influence sleep into the Spring. This finding was consistent with a recent study on perceived COVID-19 health threat, beliefs about discrimination in medical settings, and psychological distress among Black adults. These findings are also congruent with other studies analyzing COVID-19 threat and other health outcomes including psychological distress among adults who had no prior mental health problems.

While we found that job loss and pay/hour reduction due to COVID-19 were associated with worse sleep in March, the association was explained with controls for the other COVID-19 measures such as COVID-19 threat, and the differences were not significant in April. Job loss or pay reductions may be immediately stressful, but over time may become less impactful for sleep. Indeed, the Coronavirus Aid, Relief, and Economic Security act was passed in late March and provided additional enhanced financial assistance for the unemployed that was implemented by April which may have helped buffer any financial stress. Thus, the immediate financial stressors of job loss may have waned for many by April. Sleep health remains a multidimensional concept comprised of unique dimensions of sleep. It is possible differential associations would be observed for other measures of sleep. For instance, sleep duration tends to increase with unemployment or reduced working hours. Thus, the extent to which these processes influenced other measures of sleep remains less clear and is an important area for subsequent research.

Additionally, we found that those who had difficulty adjusting to caring for their children experienced significantly higher odds of reporting sleep troubles. Importantly, this association remained significant in the models that accounted for the other COVID-19 hardship measures and remained significant in April, suggesting that stress over childcare was a unique dimension of COVID-19 threat that was independently associated with sleep troubles. While past research has suggested that stressors related to caregiving increase sleep problems, we are unaware of research that has found the increased stress from childcare due to COVID-19 was related to increased sleep problems. Additionally, past research has found that

Table 1

| Covariates | Mean or % |
|------------|----------|
| Male (female = ref) | 46.8% |
| Race/ethnicity | |
| White (ref) | 71.7% |
| Black | 7.1% |
| Latino | 15.6% |
| Other | 5.5% |
| Age grouping | |
| 18-29 (ref) | 9.8% |
| 30-49 | 30.9% |
| 50-64 | 31.1% |
| 65+ | 28.2% |
| Region of residence | |
| Northeast (ref) | 16.2% |
| Midwest | 22.0% |
| South | 39.1% |
| West | 22.7% |
| Married (not married = ref) | 57.8% |
| Nativity | |
| United States | 87.4% |
| Puerto Rico | 0.5% |
| Other territory | 0.3% |
| Mexico | 2.7% |
| Cuba | 0.8% |
| Other | 3.3% |
| Educational attainment | |
| College graduate (+ ref) | 57.6% |
| Some college | 29.1% |
| High school or less | 13.3% |
| Household income | |
| <$75,000+ (Ref) | 48.5% |
| $75,000-77,999 | 34.5% |
| $80,000+ | 17.0% |
| Insured (not insured = Ref) | 93.7% |
| Previously diagnosed with mental health condition | 15.8% |
| n | 8130 |

Data Source: Pew Research Center, American Trends Panel Dataset.
Notes: COVID-19 hardship questions asked in Wave 64 (March 19-24). Data are weighted.
infants who lived with mothers who were confined at home slept longer, but the stress levels or the sleep of mothers was less clear. As schools reclosed in the Fall and Winter of 2020, if this association reemerged remains an important area of future research. Notably, past research has indicated that sleep is related to parenting quality further clarification of this potentially bi-directional association is critical for future researchers to investigate. In supplemental analyses we found that the associations between COVID-19 stressors and sleep troubles did not vary by gender and race/ethnicity. This finding was unexpected given women and racial minorities are more at risk of COVID-19-related inequities. Indeed, in ancillary descriptive analyses we found that Black Americans (7.23) and Hispanic Americans (7.43) had higher levels of COVID-19 threat compared already considerable inequities in sleep. Additionally, Americans of Color and women already have markedly worse sleep than White or male Americans so these novel stressors may not have further exacerbated already considerable inequities in sleep. Additionally, Americans of Color and women may have developed coping strategies or resilience to stressors whereas White or male Americans may not have, which would minimize any COVID-19-specific differences. Finally, this was also early in the pandemic when the severe inequities, nor their implications for sleep, may not have been fully realized.

There are important limitations that should be considered. Our measure of sleep troubles is self-reported, and self-reported measures correlate poorly with objective measures of sleep. However, past researchers have argued that self-reported sleep quality measures have face and external validity, as they represent the vague complaints represented when people report with sleep problems and are also linked to subsequent health outcomes. Importantly, we have no a priori reason to assume any inaccuracies or biases of the measure of sleep problems would vary systematically with our measures of COVID-19 hardships nor are we aware of any nationally representative datasets that collected objective measures of sleep in the Spring of 2020. Another important limitation is that there were no measures of sleep troubles collected at the first wave included in our analysis (Wave 63.5). Additionally, we lacked a comprehensive list of COVID-19 hardships. Also notably, the hardship measures we analyzed have not been explicitly validated. COVID-19 may have altered sleep through other difficulties (eg, contracting COVID-19) that the ATP did not collect information about in the waves we investigated. Some of our covariates also have important heterogeneity that we were unable to systematically analyze. For example, the marital status variable only differentiated those who were married from those who were unmarried which obscures other relationship categories (eg, widows, long-term cohabiters). In our race/ethnicity covariate, the “other race American” category includes the racial/ethnic groups such as Native Americans, Asian Americans, and others. While the ATP is a population-based sample, it may not be perfectly representative of the US adult population; however, we are unaware of representative samples in the field of March or April of 2020 that collected similar measures. Finally, we only analyzed sleep during 2 time periods; this research should be revisited with more periods of time to understand the shifting determinants of COVID-19 hardships and sleep as well as sleep trajectories throughout the COVID-19 pandemic.

Conclusions
Overall, our results from a prospective, population-based sample indicated that the novel hardships adults in the United States faced due to COVID-19 were associated with self-reported sleep difficulties. As hardships from COVID-19 continue to linger throughout society, clinicians should pay special attention to their patients who report hardship from COVID-19 and should be taught effective sleep strategies and hygiene. Parents who experienced stress with childcare in particular should be of focus. COVID-19 has dramatically altered American society, and continued analysis of how it has altered Americans’ sleep is critical.

Declaration of conflict of interest
The authors have declared no conflicts of interest.

Supplementary materials
Supplementary material associated with this article can be found in the online version at doi:10.1016/j.sleh.2022.01.001.

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