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The association of psychosocial factors and sleep duration among U.S.-born and Foreign-born Black Adults

By

Rukkayya Sule Labaran
Degree to be awarded: Master of Public Health

Department of Epidemiology

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The association of psychosocial factors and sleep duration among U.S.-born and Foreign-born Black Adults

By

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B.S.
East Tennessee State University
2018

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Abstract

Background: Black adults in the U.S., a heterogeneous group are more likely to experience psychosocial stressors, which may contribute to the higher prevalence of short sleep duration in this population. Identifying salient psychosocial stressors may help to target intervention and reduce the burden of short sleep duration. We investigated the cross-sectional association between psychosocial factors (e.g., stress and work hours) and sleep duration among U.S.-born and Foreign-born Black adults.

Methods: Using data from the 2012 National Health Interview Survey, we studied 2,925 Black participants, U.S.-born (n=2,503) and Foreign-born adults (n=422). We fit Poisson regression models with robust variance to estimate the associations of frequent stress and work hours and short sleep duration (<7 hours) adjusted for socio-demographic factors (age, sex, education, household income, etc.), health behaviors (smoking, alcohol consumption and physical activity) and clinical characteristics (BMI and overweight).

Results: The overall sample had a mean age of 40 $\pm$ 0.3 years, 52.2% were women, 40.6% were college graduates, 21.4% worked long hours ($\geq$ 41 hours), 22.5% reported frequent stress and 39.7% reported sleeping < 7 hours. Compared to individuals who did not report frequent stress, Black adults who reported frequent stress had 49% higher prevalence of short sleep duration, after adjusting for covariates (PR 1.49 [95% CI=1.33, 1.67]). After controlling for covariates, Black individuals who worked $\geq$41 hours had a higher prevalence of short sleep duration (PR=1.28 [95% CI=1.05,1.57] than individuals who worked 1-34 hours. In the stratified analyses by nativity, only U.S.-born Black adults who worked $\geq$41 hours had a higher prevalence of short sleep duration (PR=1.27 [95% CI=1.02, 1.57]) than individuals who worked 1-34 hours after adjusting for relevant covariates. No statistically significant associations were observed for Foreign-born Black adults and long work hours.

Conclusion: Frequent stress was associated with short sleep duration regardless of nativity, however, the association between long work hours and short sleep duration was only among U.S.-born Black adults. These findings suggest that stress may be a point of intervention for U.S.-born and Foreign-born Black adults to improve sleep duration. Future studies should examine work-related stressors and sleep among U.S.-born Black adults.

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INTRODUCTION

Sleep is a pertinent determinant of health that is necessary for full restoration of the human system. It is a physiological state that is determined by two processes: homeostatic and circadian process.[1,2] In the homeostatic process (Process S), sleep drive is regulated to ensure accumulation of sleep pressure at the end of a waking period and dissipation during sleep.[2,3] In the circadian process (Process C), a biological clock mechanism, determines the onset of sleep and wakefulness.[1,2,4] Sleep is characterized by non-rapid eye movement (NREM) and rapid eye movement sleep (REM).[5,6] Sleep cycles between NREM stage 1 (transition between wakefulness and sleep), NREM stage 2 (drop in body temperature and slower heart rates), NREM stage 3 (transition period between light sleep to very deep sleep), and REM stage (characterized by muscle paralysis and dreaming).[5,6] During sleep, individuals cycle (4-5 times) through the sleep stages with each cycle lasting for approximately 90 to 120 minutes.[6,7] All these processes contribute to the regulation of sleep. Sleep is necessary for neural development[8], metabolic[9], hormonal[10,11], and cardiovascular regulation.[12] The American Academy of Sleep Medicine recommends 7-8 hours of sleep for adults.[13,14] Short sleep duration defined as <7 hours per day, is an increasing public health problem in the United States (U.S.) that is yet to be resolved. There are more individuals in recent times who report sleeping less than <7 hours per day in the U.S. than in the past. Between 1975 and 2006, the proportion of adults who consistently sleep less than 7 hours a day (adult short sleepers) increased from 7.6% to 9.3%[15], and by 2017 that increased to 15%.[16] This is a public health problem because sleeping less (< 7hours) or more (≥ 9 hours) than the recommended duration (7 – 8 hours) is associated with adverse health outcomes. Epidemiologic data have shown that short sleep duration and long sleep duration have been associated with increased risk of obesity, hypertension, cardiovascular disease, and

mortality.[12,17-22] There are several pathways by which inadequate sleep duration may lead to poor health outcomes. Short sleep duration can alter brain function as well as the cardiovascular, endocrine, and nervous systems, and disrupt the regulation of hormones (i.e. leptin, cortisol and, ghrelin) that regulate appetite.[11] Some of the cardiometabolic consequences of short sleep duration include increased blood pressure and urinary excretion which indicates increased sympathetic nervous system activity[21], and elevated inflammatory markers.[22] The prior evidence supports that sleep duration is an important target for improving health, and emerging data suggests that sleep duration may play a role in health disparities.

Short sleep duration is disproportionate across racial and ethnic groups in the U.S. Epidemiologic studies have demonstrated that Black individuals experience shorter sleep duration and poorer sleep quality compared to White individuals.[15,16,23,24] For example, a study by Whinnery et al using the National Health and Nutrition Examination Survey, found that Black individuals had 2.3-fold higher odds of reporting very short sleep (<5 hours), and 1.8-fold odds of short sleep (5-6 hours), when compared to their White counterparts.[25] Similar evidence exists using objective sleep measures as well as other dimensions of sleep such as sleep quality.[26-28] A limitation of the prior work is that the heterogeneity of the Black population is not taken into account.

There are differences between Foreign-born Black and U.S.-born Black individuals. Some of these differences include culture and lifestyle beliefs (i.e. cultural value placed on education, and how the language used at home affects health)[29,30], stressors (e.g., Foreign-born are exposed to acculturative stress than U.S.-born individuals)[31,32], and social support.[33] There could be an immigrant health advantage, which suggests that immigrants who migrant to the U.S. have better health than their native counterparts.[34,35] Research suggests that immigrants tend

to arrive in the U.S. with a health advantage and maintain it over a time period compared to native-born individuals.[35,36] Hamilton et al. found that African immigrants reported and sustained better self-reported health over U.S.-born Black adults.[36] The authors speculated that their finding is strong evidence of immigrant selectivity, which suggest that migrants possess certain traits (i.e., better health or higher education) that are different from individual who stay behind.[36,37] Although, these studies are insightful when considering self-rated health, few studies have examined the immigrant's health advantage as it relates to sleep duration. Therefore, it is important to understand how sleep duration is distributed within the U.S. Black population to determine factors that may increase risk and those that may promote resilience.

Although sleep research among Black individuals is increasing, few researchers have examined sleep health among U.S.-born and Foreign-born Black adults. A study among Caribbean Black adults compared to their White counterparts showed that there was a one-hour difference in sleep duration between these races, and African/Caribbean Black adults had shorter sleep durations than their White counterparts.[38] This suggests that Black Foreign-born individuals are also disproportionately affected by suboptimal sleep, but the extent to which the sleep may differ from U.S.-born Black adults is understudied. In a study by Jackson et al. using National Health Interview Survey (NHIS) data, the authors found that non-U.S. born Black adults had a higher prevalence of short sleep duration (<7 hours) compared to U.S.-born Black adults.[39] A study by Jean-Louis et al., found that Caribbean Americans reported fewer sleep complaints than U.S.-born African Americans.[40] These conflicting findings might be due to the different study samples – one study included all Non-U.S. Black adults, the other was among Caribbean Americans, which are culturally different. Also, in the study by Jackson et al., the study sample was a nationally representative sample of 175,244 U.S. adults, whereas the study

by Jean-Lois et al., consisted of 1,118 individuals living in Brooklyn. The sleep dimensions were also different between the studies, the former used sleep duration while the latter used sleep quality, which are different dimensions of sleep health.[41] To fully understand the sleep of Black adults, it is important to identify the determinants of suboptimal sleep, which may vary by nativity in both U.S.-born and Foreign-born Black adults. For example, Foreign-born Black adults may encounter different stressors in the U.S. such as racism, which may not have been previously experienced, and may lead to a stronger response.[42] They may also encounter acculturation stress[32], pre-migration stress[43], relational stress[44], and social status/contact stress[33,45]. Based on the prior literature, it is plausible that the immigrant health advantage may decline over time[46] or Black immigrants may have worse sleep due to the introduction of new stressors.

Psychosocial factors, a combination of psychological and social factors, are associated with poor health outcomes, and sleep in particular. Stress, a psychological factor that is influenced by an individual's social factors, is a complex condition that manifests emotionally, cognitively, and biologically.[47,48] Psychosocial stress may disrupt sleep by interfering with the endocrine and immune systems, hypothalamic-pituitary-adrenal axis, and increasing the activity of the autonomic nervous system.[48] For example, stress may cause excessive excretion of cortisol, which affects the neural structures that influence sleep by increasing activity in the endocrine system.[49] Additionally, stress may affect sleep architecture by decreasing REM sleep and increasing awakenings.[49] Given the negative influence of stress on sleep, it is important to identify unique stressors to the sleep of Black adults as well as understand how sleep may affect different subgroups (U.S.-born, Foreign-born) of Black adults.

Psychosocial factors, a combination of psychological and social factors, may contribute to the burden of short sleep duration in the Black population.[47,50,51] Emerging evidence suggests that Black individuals experience more and higher levels of stress (financial, relationship, and social stress), which has been shown to be associated with short sleep duration.[49,50,52-54] Black individuals who experienced higher psychosocial stressors (i.e., ongoing stressful conditions, stressful life events, and major events) which decreases sleep efficiency and REM sleep, were more likely to sleep fewer hours.[49,50,52] Hall et al, using data from a diverse sample in the SWAN study, examined chronic stress and sleep, reported an association between chronic stress and sleep disturbance in women.[53] A study by Johnson et al, using the Jackson Heart Study, found that among Black individuals, stress was associated with short sleep duration and poor sleep quality.[52] In a focus group by Covington-Ward et al, they discovered that African immigrants experienced five major sources of stress: remittances, financial and job-related challenges, children, disconnected families, and unrealized expectations.[55] The prior stressors are different than the commonly reported stressors (e.g., acute life stressors and race-related stressors) by U.S.-born Black adults.[56,57] The work-related stressors reported by Foreign-born Black adults may result from shift work and long work hours than among U.S.-born Black adults.[38] Foreign-born Black adults may work longer hours due to the need to support others in their home country.[39] Therefore, work-related stress might be a unique stressor for Foreign-born Black adults compared to U.S.-born Black adults.

Long work hours are common among Black individuals[58], and may contribute to poor sleep in this population. Individuals that work long hours report more stress and fatigue.[59] Research suggests that there is a relationship between working long hours and short sleep duration.[60,61] Virtanen et al., using data from the Whitehall Prospective cohort study, discovered

that working long hours was a risk factor for short sleep duration and difficulty in falling asleep.[61] A study by Ertel et al., found that African/Caribbean immigrants were more likely to work more than 40 hours/week compared to their White and Hispanic counterparts.[38] Also, when work hours were adjusted for, the difference in sleep duration between African/Caribbean and White participants was attenuated.[38] Studies have speculated that long work hours may disrupt sleep by reducing opportunity for sleep.[58,60] These studies establish the presence of a relationship between long work hours and short sleep duration, however, only a few have examined this association within the Black population.

Based on the literature we have identified several gaps. Although limited, studies on stress and sleep among U.S.-born Black adults, tend to ignore the heterogeneity of the population. Stressors such as long work hours, which are common in the Black population are understudied in regards to sleep. The studies on long work hours are predominantly conducted among White samples. Addressing these gaps can provide new knowledge regarding the sleep of U.S.-born and Foreign-born Black adults. Therefore, we examined the association between psychosocial factors including stress and work hours with short sleep duration among U.S.-born and non-U.S. born Black adults. We explored whether the associations between stress or work hours, and sleep duration varied by nativity. This study will fill a gap in the literature by identifying relevant stressors that may lead to worse sleep among Black individuals and explore whether Foreign-born individuals may be more vulnerable to the effects of work hours on sleep. Based on prior literature, we hypothesize that individuals who report frequent stress and individuals who work long hours will have shorter sleep duration compared to individuals who do not report frequent stress and long work hours. This study may inform targeted interventions

addressing the identified psychosocial factors that may be particularly relevant to the sleep of Black adults.

METHODS

Data source

The National Health Interview Survey

This study analyzes data from the 2012 National Health Interview Survey (NHIS), a cross-sectional household interview survey of noninstitutionalized civilians residing in the U.S. The NHIS uses a three-stage stratified cluster probability sampling design to conduct in-person interviews allowing for extrapolation to the U.S. population. Details on NHIS procedures and sample design are reported elsewhere.[62,63] Trained personnel for the U.S. Census Bureau used computer-assisted personal interviewing (CAPI) technique to collect information on socio-demographic data, health risk, and chronic conditions or diseases. Extensive health-related information was collected from one randomly selected adult and child (if available) in each household. This analysis focused on adults, and the final response rate for the adult sample in 2012 was 79.7%. Written informed consent forms were collected from all participants in the NHIS.

Study Sample Participants

Participants of the current study include non-Hispanic and Hispanic/Latino Black (hereafter, Black) individuals aged ≥18 years. Participants were excluded if they had missing data on sleep duration, nativity status, stress, work hours, or employment. Individuals (4.9%)who

had a sleep duration of ≥ 9 hours were excluded from this analysis and set to missing due to limited sample size.

Measures

Sleep duration

Participants were asked to self-report their sleep duration by answering the question "On average how many hours of sleep do you get in a 24-hour period?". In this study, short sleep duration was defined as < 7 hours of sleep within a 24-h period based on prior literature.[13,64] Sleep duration was analyzed as a categorical variable grouped as, short sleep (<7 hours) and recommended sleep (7-8 hours). The reference group is recommended sleep (7-8 hours) because research shows it is associated with the lowest morbidity and mortality.[65,66]

Psychosocial Factors

Psychosocial factors included stress and work hours. Participants self-reported perceived stress by answering the question "During the past 12 months, have you frequently felt stressed?" Frequent stress is analyzed as a categorical variable with the response either 'yes' or 'no'.
For work hours, participants were asked "How many hours did you work last week at all jobs or businesses?". Work hours were analyzed as a categorical variable divided into three groups "1-34 hours", "35-40 hours" and "≥41 hours".[24] Long work hours were defined as ≥ 41 hours. The reference group is "1-34 hours".

Nativity

Nativity status was measured by asking participants the question "where were you born?". If they reported they were born in a U.S. state or the District of Columbia, or a. U.S

territory, they were classified as U.S.-born individuals. Those who reported that they were born outside the U.S. or U.S. territories, were classified as Foreign-born individuals.

Covariates

Participants reported gender (male or female), marital status (never married, married/living with a partner, or divorced/separated/widowed), length of residence in the U.S. ('<15 years' or '≥15 years'), employment status (currently employed or not employed, or not in the labor force), educational attainment (less than high school, high school, some college, and college graduate), household income (<$35,000, ≥$35,000), occupational category (professional/management, support services, and laborers), smoking status (never, current or former), alcohol consumption (never, current or former), physical activity (never/unable, low or high). Height and weight data were used to calculate the body mass index (BMI).

Statistical Analyses

The analytic sample, N=2,925 was derived from the NHIS 2012 survey of respondents with complete data for sleep duration, frequent stress, work hours, and nativity status. This included 2,503 U.S.-born and 422 Foreign-born Black adults. Sampling weights were employed to account for oversampling of certain groups, non-response, and unequal probabilities of selection due to study design. To describe the population overall, study characteristics were displayed as mean ± standard errors (SE) for continuous variables, and percentages for categorical variables. Sample characteristics by nativity were compared using chi-square tests categorical variables and t-tests for continuous variables. Poisson regression model with robust variance estimator was used to estimate prevalence ratios (PR) and their corresponding 95%

confidence intervals (CI) for sleep duration and psychosocial factors (stress and work hours) among US-born and Foreign-born Black individuals. A crude and fully-adjusted prevalence ratio for short sleep duration and psychosocial factors were computed and presented. First, we considered the main effect by examining the associations of psychosocial factors (stress and work hours, separately) and short sleep duration (Model 1). We then adjusted for socio-demographic factors (age, gender, marital status, income, educational attainment, employment status, occupation), health behaviors (smoking status, alcohol consumption, and physical activity), and overweight for Model 2. We then tested for interaction between the psychosocial factors and nativity, and show the associations of the psychosocial factors and sleep stratified by nativity status. In the stratified models for Foreign-born only, length of U.S. residence was included in the model. Results were considered significant at p-value < 0.05. Analyses were done using SAS statistical software version 9.4 (SAS Institute, Cary, NC, USA) and R Studio Version 1.3.1093 (R Studio Inc, Boston, MA).

Results

Descriptive Statistics

The distribution of participants' characteristics by nativity status are presented in Table 1. Among the U.S.-born adults (85%), the mean age was 39 $\pm$ 0.36 years, 53.8% were women, 35% were married, and 40% were college graduates. Ninety-six percent were currently employed, 90% had one or less jobs, 49% worked in support services occupation. Foreign-born adults had a mean age of 42 $\pm$ 0.87 years, 43% were women, 54% were married, and 43% were college graduates. Ninety-nine percent were currently employed, 89% had one or less jobs, 51% worked in support services occupation. Compared to U.S.-born, Foreign-born Black adults were more

likely to be older (42 years vs. 39 years), men (56% vs. 46%), and married (54% vs. 35%), respectively. With regards to health behaviors and clinical characteristics, Foreign-born adults were more likely to never smoke cigarettes (81% vs 71%) or consume alcohol (38% vs 24%), but were more likely to be overweight (43% vs 33%) compared to U.S.-born adults. The prevalence of short sleep duration was similar between Foreign-born adults (40%) and U.S.-born adults (39%).

Figure 1 shows the distribution of psychosocial factors by nativity. U.S.-born black adults were more likely to report more frequent stress than Foreign-born Black adults. The majority of U.S.-born Black adults worked 35 – 40 hours (55%) and 22% worked $\geq$ 41 hours, while 59% of Foreign-born Black adults worked 35 – 40 hours and 19% worked $\geq$ 41 hours.

Psychosocial factors and sleep duration in Overall Population

Table 2 shows the unadjusted and adjusted prevalence ratios for short sleep duration by psychosocial factors. In the unadjusted model, frequent stress was associated with a higher prevalence of short sleep duration PR=1.57 (95% CI=1.40, 1.74). Adjusting for confounders resulted in a reduction in the prevalence ratio for frequent stress and short sleep duration PR=1.49 (95% CI=1.33, 1.67). Compared to participants who worked 1-34 hours, participants who worked $\geq$ 41 hours had 28% (PR=1.28 [95% CI=1.05,1.57]) higher crude prevalence of short sleep duration. This estimate remained the same after controlling for confounders. There was no observed difference in the prevalence of short sleep duration between those who worked 1-34 hours and participants who worked 35 – 40 hours.

Psychosocial factors and Sleep Duration by U.S.-born and Foreign-born Black adults.

Table 3 shows the results for the associations between psychosocial factors and short sleep duration by nativity. In the unadjusted model, Foreign-born Black adults who reported frequent stress had 68% (PR=1.68 [95% CI=1.23, 2.27]) higher prevalence of short sleep duration, whereas U.S.-born Black adults had 55% (PR=1.55 [95% CI=1.38, 1.74]). After adjusting for confounders, the prevalence ratio for U.S.-born Black adults reduced significantly (PR=1.46 [95% CI=1.28, 1.65]), while Foreign-born Black had a minimal reduction (PR=1.67 [95% CI=1.23, 2.26]). Long work hours was associated with 26% (PR=1.26 [95% CI=1.05, 1.52]) higher prevalence of short sleep duration among U.S.-born Black adults, in the unadjusted model. This estimate increased after adjustments for confounders (PR=1.27 [95% CI=1.02, 1.57])**.** There was no observed association between long work hours and short sleep duration among Foreign-born adults.

Discussion

This study investigated the association between psychosocial factors (e.g., stress and work hours) and sleep duration among U.S.-born and Foreign-born Black adults. Using a nationally representative sample of Black adults in the U.S., there were two main findings. Black adults who reported frequent stress had a higher prevalence of short sleep duration compared to those who did not report frequent stress. Black individuals who worked $\geq$ 41 hours had a higher prevalence of short sleep duration than individuals who worked 1-34 hours - this association was driven by U.S.-born Black adults. This study contributes to the literature by identifying different stressors experienced among U.S.-born and Foreign-born adults, which are important in improving sleep among Black adults.

The literature on sleep duration comparing U.S.-born and Foreign-born Black individuals have been mixed. In the current study, the prevalence of short sleep duration was similar between Foreign-born (40.4%) and U.S.-born (39.6%)individuals. Similarly, a NHIS study of 23,512 participants found 28.2% of Foreign-born adults reported short sleep duration, compared to U.S.-born adults (29%). On the contrary, another study using NHIS data among 175,244 participants (27,730 were Black adults), found that Black immigrants had a higher prevalence of short sleep duration than U.S.-born adults.[39] The population characteristics for the prior study are similar to the current study, in that, Black immigrants were more likely to be married and have college education.[39] However, our results may differ because the current study was limited in sample size and spanned only 1-year of data, whereas the prior spanned 10-years. This is important to note because, collecting data over a span of multiple years accounts for any change in sleep patterns and other variables (i.e., age, household income, education, etc.) that influence sleep. The similar prevalence of short sleep duration by nativity in the current study may be attributable to the higher percentage of Foreign-born Black adults (59%), that have resided in the U.S. for more than 15 years, thus suggesting a more acculturated sample. Research among racially diverse samples suggests that Foreign-born individuals who have resided in the U.S. for more than 15 years, experience poor sleep quality similar to U.S.-born individuals, which likely eliminates the initial immigrant health advantage.[36,46] Years in the U.S. is often used as a proxy for acculturation, which may explain why the sleep between the groups in this study were similar. Despite the similar prevalence, it is important to note that the prevalence of short sleep duration in this sample was high for both groups, which is similar to estimates observed among Black adults in the general population (41%).[16] Given this high prevalence of short sleep duration, and the association between short sleep duration and poor health outcomes, which

disproportionately affect Black populations, it was important to identify determinants of short sleep duration in this sample.

In this study, psychosocial factors - stress and long work hours were associated with short sleep duration. Based on our hypothesis, individuals who reported frequent stress had a higher prevalence of short sleep duration than individuals who did not report frequent stress. This finding is consistent with the literature. In a large sample of Black adults in the Jackson Heart Study, psychosocial stress was associated with fewer hours of sleep.[50] In another study, Johnson et al. reported that psychosocial stressors were associated with higher odds of short sleep duration.[52] In examining specific psychosocial factors, Cain-Shields et al., reported that while there was no association between goal-striving stress (GSS) and sleep duration, Black participants who reported high GSS had poorer sleep quality.[54] Although we did not examine sleep quality in the current study, we did expand the literature by studying specific stressors and exploring these associations by nativity. The Black population is heterogeneous, and due to cultural differences, the sleep health of U.S.-born and Foreign-born Black adults may differ. Although we found that Foreign-born Black adults reported frequent stress less than U.S.-born (16% vs. 23.6%), the association was pronounced in both groups. Taken together, these results support that stress may be a salient risk factor for short sleep duration among Black populations. Future studies should identify the country of origin to further understand unique stressors to the sleep of these populations.

This study is novel in examining the associations between psychosocial factors and sleep duration among U.S.-born and Foreign-born Black adults. The association between stress and sleep was consistent for both groups. This finding could be due to the measure of stress, which did not specify a specific stressor but was a global measure of frequent stress. The literature

suggests that the stress Foreign-born individuals experience is different from that of U.S.-born.[56] Foreign-born individuals may experience stress from acculturation[32,67], disrupted social status/contact[33,55], while U.S.-born individuals experience stress from racism, prejudice, and segregation, which have contributed to wealth gaps and health disparities.[56,68] For instance, a study using NHANES data, found that duration of stay and acculturation contributed to higher allostatic load (cumulative burden of chronic stress and life events) for Black immigrants, while acute life stressors linked to marital disruption were predictive for high allostatic load for U.S.-born Black adults.[57] This supports the need for future research to identify the specific stressors by nativity to the sleep of U.S.-born and Foreign-born Black adults.

In identifying specific stressors to sleep duration, we investigated associations with long work hours. We found that long work hours were associated with short sleep duration. Black individuals who reported working $\geq$41 hours had a higher prevalence of short sleep duration than individuals who reported working 1-34 hours. This finding expands the literature, which mainly focused on work hours and sleep in predominately white samples. Our finding is consistent with data shown among the Whitehall II prospective cohort study of White civil-servant adults, which reported that working long hours was related to shortened sleep.[61] In a study by Nakashima et al, they found working long work hours had a dose-response correlation with reduced sleep quality.[69] On the other hand, a study by Akerstedt et al, found that high work demands, a work stress factor, was associated with a higher risk of disturbed sleep, but overtime work was not related to disturbed sleep.[70] Based on our findings, short sleep duration for Black adults is affected by stress and work hours. This finding is particularly important because long work hours is a stressor, and may be related to more exposures to other stressors such as microaggressions and racism, often experienced by Black adults.[56,71-73] That is, perceived racial discrimination in

the workplace, especially in predominantly white work settings, increases perceived work stress for Black adults. Therefore, establishing long work hours as a stressor for this population, not only highlights another factor that contributes to stress for the Black population, but also identifies ways to improve sleep for this population.

The association between work hours and short sleep duration was observed only among U.S.-born Black adults. Our findings are different from prior studies. In the current study, the proportion of individuals who worked $\geq$ 41 hours was similar between U.S.-born and Foreign-born Black adults. Whereas, in a study by Lozano, they found that immigrants were less likely than natives to work long hours in the U.S.[74] They speculated that immigrants were less likely to work long hours if they earned less than natives in an occupation, and experience discrimination in the workplace. The null association between long work hours and sleep among Foreign-born adults may also be explained by social support. Foreign-born Black adults in this study were more likely to be married than U.S.-born adults, which may suggest less financial stress, and long work hours may not be a stressor. However, being married and potentially having a working spouse did not reflect a difference in income level, because both U.S.-born and Foreign-born individuals had similar proportions of household income. Other reasons for the null association may be due to cultural differences in work hours. For example, Foreign-born adults may originate from countries that work longer hours or have different cultural norms that may cause long work hours to be a stressor.[75,76] Our findings highlight the need for future studies to explore possible cultural factors such as beliefs about work, family structure, and work-family relations that may be unique to this population.

There are important strengths to the current study. Our results were based on a nationally representative sample and a large overall sample size that allowed for stratification by nativity.

We included both U.S.-born and Foreign-born adults in our analysis, which takes into consideration the heterogeneity of the Black population. The results of this study could potentially inform future research to understand more of the social determinants of sleep for U.S.-born and Foreign-born Black adults separately. Future research should distinguish between U.S.-born and Foreign-born Black adults given the determinants of poor sleep may be different, as our study has shown. Additionally, our findings highlight the importance of identifying specific within-group stressors in order to develop targeted interventions to improve sleep health.

This study has several limitations. Data for our study is based on self-reported sleep duration and stress which are subject to bias.[77] Prior studies have shown a moderate correlation between self-reported and objective measures of sleep, that was systematically biased by different demographic characteristics.[78] Also, the measurement error for self-reported sleep duration is unknown among Foreign-born Black adults, thus there could be differential measurement error. The self-reported nature of our data lends itself to certain biases such as recall bias, social desirability bias, and misclassification.[77] The measurement for stress was not validated and only captured feelings of frequent stress during the past 12-months, which does not include specific stressors. This analysis did not include sleep quality, sleep disturbance, and sleep disorder, which have also been shown to be associated with stress among Black adults. Our findings are based on a cross-sectional study design which does not provide temporal or causal interpretations. In addition, our findings are based on a sample of Black adults, and cannot be generalizable to other populations. Furthermore, the sample size for Foreign-born adults was smaller than that of U.S.-born Black adults, which could have affected our findings.

In conclusion, this study provides evidence that stress is associated with short sleep duration among U.S.-born and Foreign-born Black adults, and long work hours are particularly

salient for U.S.-born Black adults and not Foreign-born Black adults. Further investigations regarding specific psychosocial factors in relation to sleep characteristics among Black populations by nativity are needed and may provide useful insights on factors (i.e., cultural and behavioral) that influence sleep within this population. Given the high prevalence of short sleep duration observed in this study, interventions are needed to reduce poor sleep and subsequent adverse health outcomes. Our data suggest that stress may be an important target.

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Table 1. Distribution of selected characteristics among adults 18 years and above by nativity status						
Characteristics	**Overall (N=2925)**		**U.S.-born(N=2503)**		**Foreign-born(N=422)**	
	N or Mean	**% or SE**	**N or Mean**	**% or SE**	**N or Mean**	**% or SE**
Age years, SE	40.0	± 0.3	39.7	± 0.3	42.1	± 0.8
Sex						
Men %	1197	47.7	979	46.2	218	56.6
Women	1728	52.2	1524	53.8	204	43.3
Marital Status						
Married %	838	38.2	661	35.5	177	54.1
Divorced/separated/widowed	721	17.0	623	17.3	98	15.8
Never married	1355	44.6	1210	47.2	145	30.0
Education attainment						
< High school %	419	13.3	346	12.9	73	15.8
High school graduate	697	23.7	600	23.6	97	23.8
Some college	680	22.2	605	23.2	75	16.5
College graduate	1121	40.6	949	40.1	172	43.8
Household income						
<$35,000 %	1269	36.0	1083	35.7	186	37.4
>=35,000	1543	64.0	1324	64.2	219	62.5
Employment status						
Currently employed %	2839	97.2	2422	96.9	417	99.4
Not employed	72	2.3	68	2.6	4	0.4
Not in labor force	13	0.4	12	0.4	1	0.1
Number of Jobs						
One or less %	2566	90.2	2198	90.3	368	89.7
More than one	269	9.7	220	9.6	49	10.2
Occupation						
Professional/management %	842	29.9	725	30.1	117	29.2
Support Services	1460	49.5	1252	49.1	208	51.7
Laborers	551	20.4	472	20.7	79	19.0
Length of residence in U.S.						
< 15 years %	2676	91.3	-	-	173	40.9
>=15 years	246	8.6	-	-	246	59.0
Short sleep duration/<7 hours	1194	39.7	1021	39.6	173	40.4

Hours of sleep per day	6.9	± 0.03	6.9	+ 0.03	6.8	± 0.08
Frequent stress (yes)	733	22.5	663	23.6	70	16.0
Hours Worked						
1-34 hours %	689	23.0	593	23.3	96	21.6
35 – 40 hours	1614	55.6	1368	54.9	246	59.4
≥41 hours	622	21.4	542	21.9	80	18.9
Health behaviors						
Smoking Status						
Never %	2039	73.3	1697	71.9	342	81.2
Current	524	15.3	484	16.6	40	7.9
Former	359	11.3	320	11.3	39	10.7
Alcohol consumption						
Never %	723	26.5	562	24.5	161	38.2
Current	1806	62.2	1590	63.9	216	52.3
Former	366	11.2	323	11.5	43	9.3
Physical activity						
Insufficiently active %	2242	78.2	1916	78.1	326	78.5
Sufficiently active	646	21.7	555	21.8	91	21.4
Clinical characteristics						
BMI	30.9	± 0.2	31.5	± 0.3	27.7	± 0.4
Overweight %	964	34.7	790	33.1	174	43.9

Table 2. Prevalence Ratios of Short Sleep Duration for Psychosocial factors among Black Adults		
	Unadjusted PR (95% CI)	Fully Adjusted model PR (95%)
Frequent Stress (yes)	1.57 (1.40, 1.74)**	1.49 (1.33, 1.67)**
Hours Worked		
1-34 hours	(REF)	(REF)
35 – 40 hours	0.99 (0.85, 1.16)	1.02 (0.86, 1.20)
≥41 hours	1.28 (1.07, 1.52)**	1.28 (1.05, 1.57)**

Fully adjusted model: age, marital status, educational attainment, household income, occupation, length of residence, health behaviors, clinic characteristics
*P<0.01, **P<0.05

Table 3. Prevalence Ratios of Short Sleep Duration for Psychosocial factors among Black population by nativity status				
	U.S.-Born		Foreign-born	
	Unadjusted PR (95% CI)	Fully Adjusted model PR (95%)	Unadjusted PR (95% CI)	Fully Adjusted model PR (95%)
Frequent Stress (yes)	1.55 (1.38, 1.74)**	1.46 (1.28, 1.65)**	1.68 (1.23, 2.27)**	1.67 (1.23, 2.26)**
Hours Worked				
1-34 hours	(REF)	(REF)	(REF)	(REF)
35 – 40 hours	0.97 (0.83, 1.15)	1.00 (0.83, 1.20)	1.07 (0.76, 1.51)	1.05 (0.67, 1.64)
≥41 hours	1.26 (1.05, 1.52)**	1.27 (1.02, 1.57)**	1.38 (0.88, 2.13)	1.40 (0.83, 2.35)

Fully adjusted model: age, marital status, educational attainment, household income, occupation, length of residence, health behaviors, clinic characteristics
*P<0.01, **P<0.05

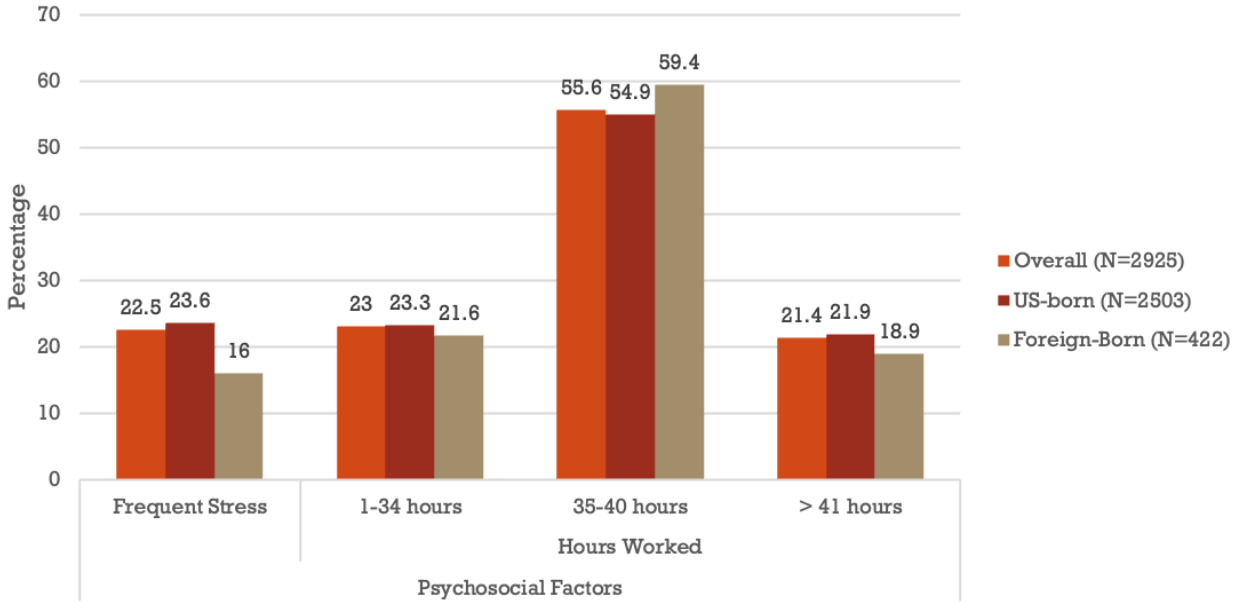

Figure 1. Distribution of psychosocial factors among Black adults 18 years and above by nativity status.