Sleep Complaints in Older Blacks: Do Demographic and Health Indices Explain Poor Sleep Quality and Duration?

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Objective: To examine the relationship between measures of sleep quality and the presence of commonly encountered comorbid and sociodemographic conditions in elderly Black subjects.

Method: Analyses included participants from the Baltimore Study of Black Aging (BSBA; n = 450; mean age 71.43 years; SD 9.21). Pittsburgh Sleep Quality Index (PSQI) measured overall sleep pattern and quality. Self-reported and objective measures of physical and mental health data and demographic information were collected for all participants.

Results: Sociodemographic and comorbid health factors were significantly associated with sleep quality. Results from regression analyses revealed that older age, current financial strain, interpersonal problems, and stress were unique predictors of worse sleep quality. Sleep duration was significantly correlated with age, depressive affect, interpersonal problems, and stress;

only age was a unique significant predictor. While participants 62 years or younger had worse sleep quality with increasing levels of stress, there was no significant relationship between sleep quality and stress for participants 81 years and older.

Conclusions: Several potential mechanisms may explain poor sleep in urban, community dwelling Blacks. Perceived stressors, including current financial hardship or hardship experienced for an extended time period throughout the lifespan, may influence sleep later in life.

Keywords: sleep quality, sleep duration, demographics, health, Blacks

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Seventy million Americans currently report ongoing complaints of poor sleep.¹ Sleep patterns and quality have been associated with health conditions, such as arthritis, diabetes, stroke, lung diseases, osteoporosis, obesity, and depression.²⁻⁵ The 2010 National Sleep Foundation (NSF) poll also showed high prevalence of sleep disturbances across all ethnic groups.⁶ However, the NSF poll, along with a small number of previous studies evaluating sleep across ethnicities, report disproportionately higher rates of sleep disorders, disturbance, and poor sleep quality among Blacks.⁷⁻¹⁰ Specifically, Blacks are more likely to report poorer sleep quality, larger disparity in overall sleep duration, and greater night-to-night variability.^{6,8-10}

Black Americans currently make up 13% of the U.S. population.¹¹ Almost 57% of the 39.8 million Black Americans presently reside in urban settings.¹² Risk of insufficient sleep has been associated with residing in an urban environment due to a number of factors including environmental noise, crime, high concentrations of poverty, and racial segregation and/or discrimination.¹³ Despite documented poor sleep within Blacks and the poor outcomes associated with poor sleep quality and quantity in general population studies,¹⁴⁻¹⁶ few studies have attempted to identify the specific sociocultural variables that may account for poor sleep among Blacks. In fact, 20% of the Black participants in the NSF⁶ reported losing

BRIEF SUMMARY

Current Knowledge/Study Rationale: Given documented studies of poor sleep in Blacks, this study was conducted to examine the potential factors that explain sleep complaints in Blacks.

Study Impact: This study identifies potential factors that may explain poor sleep in Blacks. With additional research to support these findings, potential aids to address these issues could improve sleep in Blacks.

sleep every night over current economic, health, or personal issues underscores this point. Prior research has supported that the accumulation of financial strain throughout the lifespan is associated with poor health.¹⁷ Thus, insufficient sleep in Blacks may be a result of past and current negative life experiences (i.e., financial hardships). Individuals who experienced childhood economic hardships may likely have had limited housing options, forcing them to reside in impoverished, densely populated, noisy, and/or unsafe environment.^{17,18} Thus, early in life, these individuals may have been exposed to non-conducive sleep environments. As a result, these individuals may have acquired unbeneficial sleep behaviors that continue and potentially worsen into later stages of life. Early life economic hardships also make it difficult for individuals to acquire high levels of education and employment opportunities, which can lead to lower levels of income and limited accrual of wealth in

adulthood.¹⁸ Consequently, this repeated exposure to financial strain can continually produce insufficient sleep.¹⁹ Consideration of factors such as this may help to shed more insight on the findings of previous studies including the one done by Pigeon and colleagues, who could not completely associate the sleep disturbances observed in elderly Blacks directly to current income, employment, and education.¹⁰

Thus, additional research is warranted to more definitively characterize and identify the factors associated with sleep disturbances in Blacks. This is particularly the case since a high percentage of Blacks have chronic health conditions, such as hypertension, diabetes, obesity, and coronary heart disease,²⁰⁻²⁴ which are known to be associated with indices of poor sleep. To address some of the unanswered questions in the literature, the current study explores two aims. The first aim was to examine the relationships between sleep quality/duration and several sociodemographic and health factors. The second aim was to identify what unique predictors of sleep quality/duration exist among sociodemographic, mental health, and physical indices. Specifically, we were interested as to whether childhood financial strain and/or current financial strain remained unique predictors of sleep quality and duration, even after accounting for known sleep confounders (i.e., education, income, and chronic health conditions) and potential modifiers (i.e., age).

METHODS

Participants

The study sample included urban and independently living Black American older adults from the Baltimore Study of Black Aging: Patterns of Cognitive Aging (BSBA: PCA). The overarching goal of the BSBA: PCA was to examine change in cognition, health, and psychosocial factors in older Blacks. One of the main objectives of the study, however, was to explore the patterns and individual factors that influence individual differences in cognitive functioning among older Blacks. A thorough description of the BSBA project design and outcome has been previously published.^{25,26} Participants were recruited from 29 senior housing facilities that consisted primarily (> 75%) of Blacks living in the West Baltimore area. The BSBA: PCA study broadly sampled community-dwelling adults aged 50 years and older to obtain a heterogeneous and representative sample. The only inclusion criterion for the parent study was willingness to participate in the study. A trained research assistant assessed each participant on 2 separate occasions (wave 1 and wave 2), spaced roughly 3 years apart. Each testing session took approximately 2 h and was conducted in a vacant public room of the participant's apartment building. During each testing session, participants were administered an assessment battery that included sociodemographic, physical health, and mental health measures.

The BSBA: PCA wave 1 data collection included 602 participants (449 females and 153 males). The Pittsburgh Sleep Quality Index (PSQI) was introduced and administered at wave 2; data were only included from this period of data collection. An institutional review board approved this study, and all participants provided written informed consent.

Sociodemographics

A self-reported questionnaire was used to measure demographics. The items on this questionnaire included age, sex, years of education, quality of education, income per month, current financial state, childhood finances, and employment status (employed or unemployed). Quality of education was measured by a single item that asked participants to rate from a Likert scale of 0 (poor) to 2 (good) how good an education they received. Since the distribution of monthly income was positively skewed, we created a dichotomous income variable with 2 levels (< \$1700 and ≥ \$1700) to include in the analyses. Current financial state (current finances) measured participants' response to how well their income covered their needs on a Likert scale ranging from 0 (not very well) to 3 (very well). This measure was included to better assess whether participants were experiencing financial strain based on their monthly income. Childhood finances were measured by a single item that asked participants to rate how well off their family was growing up on a Likert scale from 0 (doing well) to 3 (not getting by).

Physical and Mental Health

As an objective assessment of a basic cardiovascular health, three assessments of orthostatic blood pressure (BP) readings (while participant was sitting and standing) along with concurrent pulse rates were taken using an oscillometric automated device (A&D model UA-767).²⁷ For each individual, mean systolic (SBP), diastolic (DBP), and pulse rate values were calculated.

A cardiovascular risk factor composite score (CVRFs) was created by summing participants' self-report of whether a physician had informed them that they had any of the following conditions: cardiovascular disease, heart attack, angina, circulation problems, high blood pressure, diabetes, and stroke. The CVRFs variable had scores that ranged from 0 (no risk factors) to 7 (more risk factors). A variable was also created to account for current use of medications to treat cardiovascular risk factors (CVRFs medications). Specifically, participants' responses were summed as to whether they had been currently taking a hypertensive medication and/or insulin. To account for other potential comorbid illnesses, a non-cardiovascular health condition composite score (Non-CVRFs) was created by summing participants' self-report of whether a physician had informed them that they had any of the following conditions: arthritis, broken hip, asthma, gout, gallbladder trouble, stomach ulcers, thyroid trouble, tuberculosis, kidney trouble, and cancer. The Non-CVRFs variable had scores that ranged from 0 (no risk factors) to 10 (more risk factors). Weight and height were measured, and body mass index (BMI) was calculated and included in the current study's analyses.

The Center for Epidemiological Studies-Depression (CES-D)²⁸ scale was used to measure depressive symptoms. The CES-D is commonly used in detecting depressive symptoms in older adults across diverse populations.²⁹ Given the CES-D includes a sleep item ("my sleep was restless"), the current study's analyses included 3 CES-D component factors: Depressed or Negative Affect (CESD-DA), Positive Affect (CESD-PA), and Interpersonal Problems (CESD-IP),^{28,30} which exclude this item. These component factors have been shown to be reliable and valid measures,³⁰ particularly in Black females.³¹

The participants' sense of their "basal state of stress" was assessed with the Perceived Stress Scale.³² Participants were asked to respond to 14 items regarding stressful feelings and thoughts within the past month. The total score, which ranged from 0 (no stress) to 56 (very stressed), was included in the current study's analyses.

Locus of Control³³ is a measure of the degree of control individuals feel they have over their lives. This is a 12-item scale with 4 response categories and scores (Completely True = 0, Somewhat True = 1, Somewhat False = 3, Completely False = 4). Higher scores denote greater perceived control.

Sleep Indices

The Pittsburgh Sleep Quality Index (PSQI)³⁴ was used to assess participants' typical sleep habits and patterns within the last month. Questions were designed to assess 7 components, including sleep quality, sleep latency, sleep duration, sleep maintenance, use of sleep medications, and daytime dysfunction due to sleep habits. The continuous PSQI global score was included in the analyses and can range from 0 (good sleeper) to 21 (poor sleeper). Analyses also included the sleep duration item from the PSQI.

Analyses

Descriptive statistics were conducted to explore the demographic, sleep, and health characteristics of the sample. Pearson correlations were run to explore potential relationships between the sleep indices (sleep quality and quantity) and each of the sample characteristics. Those characteristics that were significantly correlated with the sleep indices were then included in a regression model to test whether they remained a significant unique predictor of sleep. The sex and income variables were dummy coded (0 = male, 1 = female; income: 0 = < \$1700, 1 = ≥ \$1700). Analyses were performed using SPSS, Version 17.

RESULTS

Missing Data

Although the BSBA: PCA had a total sample of 602 from the first wave of data collection, the current study only included 450 participants from the second wave of data collection. One hundred fifty-two participants were not included in wave 2 of the study and were subsequently excluded from the present analyses due to the following: death ($n = 58$), moved to a location beyond our recruitment area ($n = 21$), too sick to participate ($n = 13$), unable to be found ($n = 54$), and refusal to participate at follow-up ($n = 6$). Participants who did not participate in wave 2 were not significantly different from the participants who completed wave 1 in terms of age, sex, education, and median income.

Sample Characteristics

Table 1 illustrates the demographic characteristics of the total sample included in the present analyses. The average age of the participants was 71.43 years (SD 9.21, range 51-96). The participants were mostly female and had an average education of 11.54 years (SD 2.84, range 3-22). A majority of the participants reported being unemployed (90.9%), specifically as result of retirement (66.6%), and reported a current monthly income

Table 1—Demographic and health characteristics of sample (N = 450)

Characteristic	n (%)	Mean (SD)
Age	—	71.43 (9.21)
Sex, female	348 (77.3)	—
Education, years	—	11.54 (2.84)
Education, quality		
Good	305 (68.4)	—
OK	113 (25.3)	—
Poor	28 (6.3)	—
Income, per month	—	1100 (600)
< \$1700	358 (80.8)	—
≥ \$1700	85 (14.1)	—
Current Finances		
Very well	40 (8.9)	—
Pretty well	180 (40.2)	—
Poorly but get by	177 (39.5)	—
Not very well	51 (11.4)	—
Childhood Finances		
Doing well	59 (13.2)	—
OK	182 (40.8)	—
Barely getting by	166 (37.2)	—
Not getting by	39 (8.7)	—
Employment status		
Employed (total)	41 (9.1)	—
Full time	9 (2.0)	—
Part time	32 (7.1)	—
Unemployed (total)	408 (90.9)	—
Retired	229 (66.6)	—
Homemaker	4 (0.9)	—
Seeking work	8 (1.8)	—
Not seeking work	1 (0.2)	—
Disabled	96 (21.4)	—
CESD total	—	13.45 (4.49)
CESD-DA	—	0.91 (2.29)
CESD-PA	—	10.55 (2.39)
CESD-IP	—	0.25 (0.67)
Stress	—	19.80 (7.50)
Locus of Control	—	42.80 (11.20)
CVRFs	—	2.25 (1.50)
Non-CVRFs	—	1.74 (1.29)
CVRFs medications	—	0.57 (0.68)
SBP	—	145.30 (24.56)
DBP	—	84.40 (13.66)
Heart Rate	—	69.97 (11.75)
BMI	—	31.17 (7.85)

CESD-DA represents depressive affect component, scores can range from 0 (low) to 21 (high). CESD-PA represents positive affect component; scores can range from 0 (low) to 21 (high). CESD-IP represents interpersonal problems component; scores can range from 0 (low) to 6 (high). CVRFs represent cardiovascular risk factors. Non-CVRFs represent other comorbid illnesses. BMI represents body mass index.

of < \$1700 (80.8%). Close to half of the participants (45.9%) reported that the family finances growing up were limited.

Table 2 illustrates the sleep and health characteristics of the sample. On average, participants had a PSQI score of 7.42 (SD 3.20, range = 1-18). A majority of participants (72.4%)

Table 2—Sleep characteristics of sample

Characteristic	n (%)	Mean (SD)
PSQI global score	—	7.42 (3.20)
Score < 6	124 (27.6)	—
Score ≥ 6	326 (72.4)	—
PSQI components		
Subjective sleep quality	—	0.81 (0.79)
Sleep latency	—	0.95 (0.85)
Sleep duration	—	1.25 (0.96)
Sleep efficiency	—	2.47 (1.07)
Sleep disturbance	—	1.14 (0.52)
Use of sleep medication	—	0.42 (0.99)
Daytime dysfunction	—	0.65 (0.98)

Mean PSQI component scores range from 0 (no difficulty) to 3 (severe difficulty). Higher values for sleep disturbances represent higher frequency of reported sleep disturbances. Higher values for daytime dysfunction represent higher frequency of daytime dysfunction reports and/or reported problems with daytime dysfunction.

Table 3—Correlations of each characteristic by sleep quality and standardized coefficients and standard errors from the regression model predicting sleep quality

Characteristic	Sleep Quality ^a	Regression Model ^b
Age	-0.15 **	-0.13 (0.02) *
Sex	0.10 *	0.07 (0.39)
Income	-0.13 **	-0.02 (0.42)
Current Finances	-0.15 **	-0.10 (0.20)
Childhood Finances	0.10 *	0.09 (0.20) †
CESD-DA	0.31 **	0.10 (0.09)
CESD-PA	-0.10 *	-0.06 (0.07)
CESD-IP	0.27 **	0.13 (0.28) *
Stress	0.35 **	0.16 (0.03) *
Locus of Control	-0.17 **	-0.07 (0.02)
CVRFs	0.10 *	0.05 (0.11)
Non-CVRFs	0.16 **	0.06 (0.13)
Heart rate	0.10 *	0.04 (0.01)
BMI	0.11 *	0.03 (0.02)
R ²	—	0.23

†p = 0.07, *p < 0.05, **p < 0.01. ^aSignificant correlations between sleep quality and each characteristic. Higher values for global PSQI represent worse sleep quality. High values for sex represent female. CESD-DA represents depressive affect component. CESD-PA represents positive affect component. CESD-IP represents interpersonal problems component. CVRFs represent cardiovascular risk factors. Non-CVRFs represent other comorbid illnesses. BMI represents body mass index. PSQI Global Score column represents the association between the PSQI score and each characteristic. ^bRegression Model provides the standardized regression coefficients and standard errors for the regression model including all significant predictors (age, sex, income, family financial status growing up, CESD depressive affect, CESD positive affect, CESD interpersonal problems, stress, locus of control, cardiovascular risk factors, other comorbid illnesses, heart rate, and BMI).

had PSQI scores ≥ 6, which is suggestive of poor sleep quality. Participants reported an average sleep duration of 6.20 h (SD 1.57, range 2-12), with a majority (58.9%) reporting sleep duration < 7 hours.

Table 4—Correlations of each characteristic by sleep duration and standardized coefficients and standard errors from the regression model predicting sleep duration

Characteristic	Sleep Duration ^a	Regression Model ^b
Age	0.13 **	0.11 (0.01) *
CESD-DA	-0.16 **	-0.12 (0.04) †
CESD-IP	-0.10 *	-0.01 (0.14)
Stress	-0.13 **	-0.01 (0.01)
Locus of Control	0.12 *	0.10 (0.01) †
Heart Rate	-0.11 *	-0.07 (0.01)
R ²	—	0.05

†p = 0.07, *p < 0.05, **p < 0.01. ^aSignificant correlations between sleep duration and each characteristic. Higher values for global PSQI represent worse sleep quality. High values for sex represent female. CESD-DA represents depressive affect component. CESD-PA represent positive affect component. CESD-IP represents interpersonal problems component. CVRFs represent cardiovascular risk factors. Non-CVRFs represent other comorbid illnesses. BMI represents body mass index. Sleep Duration column represents the association between the PSQI score and each characteristic. ^bRegression Model provides the standardized regression coefficients and standard errors for the regression model including all significant predictors (age, CESD depressive affect, CESD interpersonal problems, stress, locus of control, and heart rate).

Sleep Relationships

Sleep quality (PSQI global score) was significantly related to a number of demographic, mental health, and physical health variables (**Table 3**). Specifically, younger participants, females, lower income, current financial strain, childhood financial strain, increased depressive affect, decreased positive affect, increased interpersonal problems, increased stress, decreased locus of control, increased health conditions (CVRFs and non-CVRFs), increased heart rate, and higher BMI were associated with worse sleep quality. When these significant variables were included in the regression model, younger age, current financial strain, interpersonal problems, and stress remained significant and unique predictors of sleep quality. The regression model explained 23% of the variance in sleep quality ($F_{14, 357} = 7.65$, $p < 0.001$).

Fewer demographic, mental health, and physical health variables were significantly associated with the PSQI sleep duration component (**Table 4**). Younger age, increased depressive affect, increased interpersonal problems, and increased stress were associated with greater sleep duration in participants. When these significant characteristics were included in the regression model, only younger age remained a significant unique predictor of sleep duration. The regression model explained 5% of the variance in sleep duration ($F_{6, 419} = 3.90$, $p = 0.001$).

Subsequent regression models were conducted including interaction terms between age and those characteristics that were significantly correlated with sleep to better understand the nature of the age and sleep relationship. Age was selected as an effect modifier because sleep complaints are commonly reported by older adults.² Furthermore, age differences have been observed for several of the indices (i.e., stress, health conditions) included in our models.³⁵ We only observed a significant interaction between age and stress for sleep quality.

Simple slopes analyses³⁶ were used to estimate the association between sleep quality and stress across 3 age groups (Figure 1). Results suggest that increased levels of stress were associated with worse sleep quality, particularly for the young-old participants (age ≤ 62 years; $\beta = 0.37$, $p < 0.05$).

DISCUSSION

Older Blacks adults in our sample rated their overall sleep quality as “poor.” Their average nightly sleep duration of 6.2 hours would also be considered in the range of inadequate sleep based upon the International Classification of Sleep Disorders (ICSD-2) diagnostic manual published by the American Academy Sleep Medicine. Currently, the ICSD-2 recommends nightly sleep duration of 7.5-8.5 hours for the average adult to function optimally.^{37,38} The observed self-reports of sleep duration in the current study sample is consistent with previous studies in which similar measures of sleep duration were employed in Blacks.^{8,10} Interestingly, our study demonstrates an association between sociodemographic variables (i.e., current financial strain, childhood financial strain, interpersonal problems, and internalized locus of control) and sleep quality, which expands upon the previous literature. Our results also revealed that the relationship between sleep quality and stress was modified by age. Specifically, individuals 62 years of age or younger are likely to have poor sleep quality with increasing stress levels. The lack of relationship between sleep quality and stress in the older age group may be a reflection of a survivor effect, in that those individuals with particularly high stress levels may have been more likely to have died at an earlier age.

In assessing whether economic strain in our sample was more chronic than acute, we found that childhood financial strain was associated with current family monthly income and financial strain. Our results suggested that individuals who reported greater childhood financial strain also tended to report lower monthly income levels ($r = -0.16$, $p < 0.01$) and current financial strain ($r = -0.11$, $p < 0.05$), suggesting that stressors related to these financial hardships may be experienced across the lifespan. Indeed, financial strain in early life has been shown to be associated with poor health in late life, particularly when additional financial hardships occurred later in life.³⁹ This provides insight into some of the early and unique experiences of this group. It further supports the cumulative disadvantage hypothesis^{40,41} in that the experience of stressful life events (e.g., financial strain) throughout the lifespan may explain several primary sleep disorders, including circadian rhythm disorders, primary insomnias, and poor sleep hygiene observed in the Black population. Stressful events may lead to several learned behaviors (“up all night worrying” etc.) that are non-conducive to proper sleep habits and patterns.³⁸ However, the accumulation of stressful events throughout life may further strengthen these poor sleep behaviors, which is consistent with Spielman’s theory of the manifestation and maintenance of insomnia symptoms based upon conditioned behavioral responses to distress.⁴²

Moreover, ongoing stress and its link to cortisol and HPA axis equilibrium has been postulated as one of mechanisms underlying the association between reports of high ongoing stress levels and higher cardiovascular disease risk (hypertension, low heart rate variability),⁴³ along with higher overall morbidity

Figure 1—Relationship between sleep quality and stress as it varies by age group.

* $p < 0.05$, ** $p < 0.01$.

and mortality.⁴⁴ The prolonged sympathetic activation caused by the overly active HPA system due to ongoing external stress may also serve to explain our associations between sleep and physical health indices (e.g., increased number of health conditions, high heart rate, and high BMI). Although our data do not include indices to test this hypothesis, further research should consider testing this idea.

Although our study reveals some interesting findings, there are a few study limitations that should be noted. Our participants’ subjective sleep reports may not be an accurate representation of how much and how well they typically sleep and do not account for racial differences in sleep architecture. Studies using polysomnography (PSG), the gold standard for assessing sleep, have observed that African Americans have less N3 (deep sleep)⁴⁵ and less REM sleep than whites,⁸ so our findings serves as additional support for exploring the relationship between sociodemographic and comorbid health variables with more objective measures of sleep patterns and architecture with tools, including polysomnography and actigraphy. Furthermore, these objective measures could have identified participants with clinical sleep disorders such as obstructive sleep apnea (OSA).

Given that OSA is associated with cardiovascular risk and disease⁴⁶⁻⁴⁸ and is commonly observed in Blacks,⁴⁹ it is possible that the relationship observed between sleep quality and cardiovascular risk factors (i.e., BMI and heart rate) may be explained by this clinical sleep disorder. Our study’s analyses are also limited in explaining whether stress, economic strain, or poor health causes poor sleep or poor sleep causes stress, economic strain, or poor health. Thus, further research is needed to clarify the directionality of these relationships. Lastly, our study conducted several analyses and did not control for multiple comparisons, which increases the risk of false positive findings but also decreases the likelihood for observing a significant relationship.⁵⁰ Given the limited research exploring sociodemographic and health conditions as they relate to sleep in older

Blacks, our objective was take an exploratory approach in identifying these potential relationships. Future studies, however, should further explore these relationships using alternative, more conservative approaches.

This study represents one of the largest and most comprehensive assessments of sleep quality as it relates to pertinent comorbid health and sociodemographic variables in an urban-dwelling Black American elderly cohort. This study provides additional support for further exploration of the complex and unique sociodemographic variables that may contribute to the manifestation of poor sleep quality in an urban dwelling Black elderly cohort. With the older Black population increasing, it is imperative that we address the sleep disturbances in older Blacks, as it may assist in further reducing the disparities in health between Blacks and other racial/ethnic groups. Thus, additional investigation could aid in developing community-based programs customized to the needs of this cohort to improve the overall morbidity and mortality and narrow potential obstacles related to health disparity known to be an issues within this demographic group.

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