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Short self-reported sleep duration among caregivers and non-caregivers in 2016

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Abstract

Introduction—Caregiving, providing regular care or assistance to family members or friends with health problems or disabilities, may affect caregivers' sleep. This study examined self-reported short sleep duration by caregiving status among US adults.

Methods—Data from 114,496 respondents aged ≥18 years in 19 states, the District of Columbia, and Puerto Rico from the 2016 Behavioral Risk Factor Surveillance System were analyzed. Prevalence of short sleep duration (<7 hours per 24-hour period) by caregiving status was calculated, and adjusted prevalence ratios (PR) and 95% confidence intervals (CI) were derived from a multivariable logistic regression model with adjustment for potential covariates.

Results—Nearly 1 out of 5 adults reported caregiving within the past month. A higher prevalence of short sleep duration was reported among caregivers (39.5%) than among non-caregivers (34.2%, adjusted PR [95% CI]=1.12 [1.06–1.19]). Caregivers who reported prolonged caregiving (≥5 years) reported a higher prevalence of short sleep duration than those with <2 years of caregiving. Similarly, caregivers who provided 20–39 hours of caregiving per week reported a higher prevalence of short sleep duration than those with <20 hours caregiving per week.

Conclusions—Caregivers had a higher prevalence of short sleep duration than non-caregivers. Providing information and community-based resources and supports for caregiving may minimize caregiver stress and improve sleep particularly for those with prolonged or more intense caregiving.

Keywords

Sleep deprivation; family caregivers; population surveillance; Behavioral Risk Factor Surveillance System

Introduction

An estimated 43.5 million adults (18.2% of adult population) in the US have provided unpaid care, usually to a family member or friend in the prior 12 months.[1] Caregivers

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provide substantial economic and non-economic value to the health system, and the need for caregivers is expected to increase as the US population ages.[2,3] Sleep is essential for health and wellbeing and can be affected by aging, interpersonal relationships, societal factors, and psychological stressors as well as caregiving.[4–6] Sleep disturbance is prevalent among caregivers and may be related to increased anxiety, stress, and nighttime awakenings as part of caregiving duties.[7–9] Prior research demonstrated that sleep disturbance[10,11] or low sleep quality[12] was more common among caregivers than among non-caregivers, and the association of caregiving with sleep disturbance might be impacted by both caregiver and care recipient's health conditions.[13,14] Moreover, sleep quality is only one important aspect of sleep health. Sleep duration is also critical and varies by sociodemographic characteristics such as age, sex, race/ethnicity, education, employment, and marital status; individual behaviors including smoking, exercise, and body weight; and health conditions.[15,16] Some studies reported no differences between caregivers and non-caregivers regarding sleep duration; however, the sample sizes in these studies were small.[10–12]

We assessed the association of short sleep duration with caregiver status by sociodemographic and health-risk factors among adults from 19 states, the District of Columbia (DC), and Puerto Rico in the 2016 Behavioral Risk Factor Surveillance System (BRFSS). Among caregivers, we further assessed the association of short sleep duration with caregiving duration (years providing care), intensity (hours per week providing care), and the caregiver's own health conditions as well as the care recipient's health problem.[12,17]

Methods

Participants

BRFSS, a random-digital-dialed telephone survey of US adults aged ≥18 years, is conducted by state health departments in collaboration with the Centers for Disease Control and Prevention (CDC) in all 50 states, the District of Columbia (DC), and US territories (detailed information available at https://www.cdc.gov/brfss/). Trained interviewers administer standardized questionnaires to all adult respondents. Responses are weighted to the respondent's probability of selection in order to obtain a study population representative of a given state. The BRFSS questionnaire includes core topics collected yearly, on a rotating basis, and optional modules collected at the discretion of states. The number of states that use a module can vary by year. The 2016 BRFSS core questionnaire included sociodemographic characteristics, health-related behaviors, and sleep duration. The 2016 BRFSS had the largest number of states that collected the optional caregiving module (Arizona, Arkansas, California, Connecticut, Colorado, Georgia, Minnesota, Missouri, Montana, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, South Dakota, Tennessee, Texas, Utah), DC, and Puerto Rico. The response rate for those 19 states, DC, and Puerto Rico with combined landline and cell phone samples ranged from 31.4% in California to 57.2% in South Dakota (https://www.cdc.gov/brfss/annual_data/2017/pdf/2017-sdqr-508.pdf). The study was approved as exempt research by the Centers for Disease Control and Prevention Institutional Review Board. A total of 134,701 adult respondents residing in 19 states, DC, and Puerto Rico completed the 2016 BRFSS questionnaire including a sleep duration question and the caregiver module.

Measures

Sleep duration

Self-reported sleep duration was based on the question, “On average, how many hours of sleep do you get in a 24-hour period?” The American Academy of Sleep Medicine and the Society for Sleep Research recommends that adults get seven or more hours of sleep per night for optimal health.[15] Those who reported <7 hours of sleep were classified as having short sleep duration. Evidence-based studies have shown that sleeping <7 hours in 24 hours on a regular basis is associated with impaired immune function, loss of productivity, increased errors, and greater risk of accidents as well as adverse health conditions.[15] In addition, the findings from previous studies on the association of long sleep duration (9 or more hours sleep per night) with health were not consistent and the AASM did not make a recommendation regarding long sleep duration. [15] Therefore, we only compared ≥7 hours vs. <7 hours sleep duration in this study.

Caregiver status and conditions

Caregiving status was determined by an affirmative response to a single question “During the past 30 days, did you provide regular care or assistance to a friend or family member who has a health problem or disability?”

In addition, caregivers were asked about the duration (length of time providing care to recipient) and intensity of caregiving (hours per week), and their care recipient’s condition. The duration of caregiving was categorized as “<2 years”, “2 to <5 years’, and “≥5 years” based on responses to the question “For how long have you provided care for that person?” Those who responded that they provided care for “<30 days”, “1 month to <6 months”, or “6 months to <2 years” were combined for more statistical power; a similar percent of short sleep duration was observed among those three subgroups. The intensity of caregiving was categorized as “<20 hours”, “20–39 hours”, and “≥40 hours” per week based on responses to the question “In an average week, how many hours do you provide care or assistance?”

Caregiver’s health status was assessed as the number of chronic conditions, defined as the sum (range: 0–9) of reporting any of the following doctor-diagnosed chronic conditions: diabetes, asthma ever, chronic obstructive pulmonary disease (COPD), coronary heart disease (heart attack, myocardial infarction or angina), stroke, arthritis, any cancer, depression, or chronic kidney disease.

The care recipient’s main condition for which care was needed was based on the caregiver’s response to the question “What is the main health problem, long-term illness, or disability that the person you care for has?” We collapsed some response categories with small sample sizes together based on whether the nature of the condition was similar. The care recipient’s condition was grouped as 1) major chronic condition (arthritis/rheumatism, asthma, chronic respiratory conditions such as emphysema or COPD, diabetes, heart disease, hypertension, stroke, human immunodeficiency virus infection (HIV), other organ failure or disease such as kidney or liver problems); 2) cancer; 3) dementia (or other cognitive impairment disorders); 4) developmental disabilities such as autism, Down’s syndrome, or spina bifida; 5) mental illnesses such as anxiety, depression, or schizophrenia, or substance abuse or

addiction disorder; 6) injuries; 7) old age/infirmity/frailty; 8) some other care-needed condition (not specified).

Covariates

The selected sociodemographic characteristics were age group (18–24, 25–34, 35–44, 45–64, or ≥65 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, American Indian/Alaska Native, Asian, or non-Hispanic other), education (less than high school, high school diploma or an equivalent general educational development (GED), some college or technical school, or college graduate), employment status (employed, unemployed, unable to work, retired, or homemaker or student), and marital status (married or member of unmarried couple, divorced/separated/widowed, or never married).

Leisure-time physical activity was defined as a 'yes' response to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Smoking status was defined by two questions: "Have you smoked at least 100 cigarettes in your entire life?" and "Do you currently smoke every day, some days, or not at all?" Respondents were categorized as current smokers (smoked at least 100 cigarettes during their lifetime and currently smokes every day or some days), former smokers (smoked at least 100 cigarettes during their lifetime but did not currently smoke), and never smokers (never smoked at least 100 cigarettes during their lifetime). Body mass index (BMI, kg/m^2) calculated from self-reported height and weight was categorized as underweight (BMI<18.5), normal weight (BMI=18.5–24.9), overweight (BMI= 25.0–29.9), obese (BMI≥30.0).

Statistical Analysis

Data were analyzed from 114,496 adult respondents with complete information on sleep duration and caregiving status after respondents with missing values on all aforementioned covariates except for BMI were excluded in this study. For BMI, which had the largest number with missing data, we included a "missing BMI" category when adjusting for covariates in order to minimize the impact of excluding participants with valid sleep and caregiving information.

Age-adjusted prevalence of short sleep duration and 95% confidence intervals (CIs) were calculated by caregiving status and selected characteristics. Estimates were age-standardized to the 2000 projected US population aged ≥18 years.[18] Multivariable logistic regression analyses were performed to assess the association of short sleep duration with caregiving status after controlling for age, sex, race/ethnicity, education, employment status, marital status, leisure-time physical activity, smoking status, and BMI category. In addition, separate multivariable logistic regression analyses among caregivers were performed to assess relationships between short sleep duration prevalence and the duration and intensity of caregiving after controlling for the aforementioned covariates, number of caregiver chronic conditions, and the care recipient's condition. Appropriate sampling weights for the caregiver module were applied (https://www.cdc.gov/brfss/annual_data/2016/pdf/2016moduleanalysis.pdf). All analyses were conducted using SAS (Version 9.4, SAS Institute) and SAS–callable SUDAAN (Version 11.0.3, Research Triangle Institute

International, Research Triangle Park, North Carolina) to account for the complex sampling design. All significant differences were set at $p < 0.05$.

Results

In 2016, nearly 1 out of 5 adults (19.8%) in 19 states, DC, and Puerto Rico reported being a caregiver. Compared to non-caregivers, a larger proportion of caregivers were women (59.0% vs. 49.5%), aged 45–64 years (40.9% vs. 32.0%), non-Hispanic white (62.8% vs. 56.7%), and had some college or technical school education (36.9% vs. 30.0%) (p<0.0001. Table 1). Caregivers also had a higher prevalence of obesity (31.8% vs. 27.1%), current smoking (20.0% vs. 14.3%), and short sleep duration (39.0% vs. 34.0%) compared to non-caregivers (p<0.0001, Table 1). Caregivers and non-caregivers showed similar distributions of marital status, employment status, and leisure-time physical activity.

The significant association of short sleep duration with caregiving status overall persisted after controlling for sociodemographic characteristics and adverse risk behaviors (overall adjusted PR [95% CI] =1.12 [1.06–1.19]). Among subgroups, a higher adjusted prevalence ratio of short sleep duration among caregivers versus non-caregivers was observed among both men and women, adults aged ≥35 years, non-Hispanic whites, those with ≤12 years education, employed persons, those who were married or divorced/separated/widowed, those who were underweight, former smokers or never smokers, and those with and without leisure-time physical activity (Table 2).

Among caregivers, 38.0% reported no chronic conditions, 30.0% reported one, 17.3% reported two, 12.1% reported three to four, and 2.7% reported five or more chronic conditions (Table 3). Caregivers who had at least one chronic condition were more likely to report short sleep duration than those with none of the nine chronic conditions. Additionally, the prevalence ratio of short sleep duration increased with the number of co-occurring conditions.

Of the care recipients, 25.2% had major chronic conditions, 15.2% had injury, 9.1% had dementia, 8.8% were reported with old age/infirmity/frailty, 7.2% had cancer, 6.2% had mental illness or substance abuse, 4.0% had developmental disability, and 20.6% had other care-needed conditions (Table 3). Caregivers caring for those with a major chronic condition or cancer were more likely to report short sleep duration than caregivers caring for those with other unspecified care-needed conditions after multivariable adjustment.

Almost half (49.8%) of caregivers had ≥2 years caregiving (i.e., duration) and nearly one third (30.3%) provided ≥20 hours of caregiving per week (i.e., intensity) (Table 3). Caregivers who had ≥5 years caregiving reported a higher prevalence of short sleep duration than those who had <2 years caregiving, after controlling for all covariates including caregiver's and care recipient's chronic conditions. Similarly, caregivers who provided 20–39 hours of caregiving per week reported a higher prevalence of short sleep duration than those who provided <20 hours of caregiving per week.

Discussion

Our results showed that caregiving status was independently associated with a higher prevalence of short sleep duration, both overall and within particular demographic subgroups (e.g. both men and women, those aged 45–64 years, less educated, and both employed and unemployed adults). Furthermore, short sleep duration was associated with extended duration of providing care as well as the number of hours of caregiving provided per week. To the best of our knowledge, this is the first report to demonstrate an association between self-reported short sleep duration and caregiving status in a large dataset of community dwelling adults. Short sleep duration may lead to chronic sleep loss[19] and insomnia[20] especially when caregiving is prolonged. Without intervention, caregivers with sleep loss or insomnia are at a higher risk for developing anxiety or other risk behaviors such as smoking and alcohol use, which may further disturb sleep.[21,22] Short sleep duration is associated with chronic conditions and can lead to motor vehicle crashes and accidents at work (https://www.cdc.gov/sleep/index.html). Therefore, getting enough sleep is essential to a caregiver's health and well-being.

Our results suggested that short sleep duration among caregivers versus non-caregivers might be greater among persons with adverse health status (more chronic conditions, underweight) and limited resources (e.g. lower education). For example, caregivers who were underweight were 61% more likely to have short sleep duration than non-caregivers who were underweight. Our data indicated that underweight caregivers were more likely to have 3 or more common chronic conditions such as cancer and heart disease than did underweight non-caregivers (19.1% vs. 9.5%, data not shown). In addition, caregivers with <12 years education were 21% more likely to have short sleep duration than non-caregivers with <12 years education. These results are in line with prior studies suggesting that factors such as chronic conditions[23] and living conditions among those with low socioeconomic status[24] affect short sleep duration and might be considered among caregivers with short sleep duration as well.

This study is based on a survey representing a large sample size of adults in 19 states, DC, and Puerto Rico. Our results on the overall caregiver percentage (19.8%) are comparable to that from the AARP national caregiving study in 2015 (18.2%).[1] The BRFSS was designed as a general health survey, and more detailed information about caregiving, including actual activities, perceived burden or stress, or even positive affect such as fulfillment in caring for a loved one, which may offer further insight into the relationship of caregiving to sleep health, are not collected. Furthermore, our findings are subject to the following limitations. First, our results were obtained from a cross-sectional study so we cannot draw causal inference about whether caregiving leads to short sleep duration. Second, self-reported responses to all questions in the BRFSS may be subject to recall bias, which could influence our results. Although previous studies using Actigraphy validated subjective sleep duration as a reliable measure for sleep duration,[25] further studies using Polysomnography measures of sleep may reveal more insights of the impact of caregiving on sleep. Third, the low response rate in BRFSS may result in selection bias and influence our results. Lastly, this study was conducted in 19 states, DC, and Puerto Rico so our findings are not generalizable to the whole US.

Conclusion

Caregivers of friends or family members had a higher prevalence of short sleep duration than non-caregivers. The overall effect size of caregiving on short sleep duration is small. However, informal caregivers are a major support to the health system. Our data indicated that about 22.4 million persons provided care in 19 states, DC, and Puerto Rico in 2016, which is comparable to 43.5 million caregivers in the U.S. overall according to the 2015 AARP national caregiver report.[1] Therefore, it is of public health importance to explore sleep duration among caregivers because it affects the health of both caregivers and care recipients. Caregivers may benefit from employer- and community-based programs designed for caregivers. There are several caregiver support programs or toolkits available to those caring for people with specific conditions, for example, REACH OUT for dementia (https://www.cdc.gov/aging/caregiving/activities.htm); The Alzheimer's Association caregiving programs for Alzheimer's disease and dementia (https://www.alz.org/help-support/caregiving); the COPD caregiver programs from the COPD Foundation (https://www.copdfoundation.org/Learn-More/I-am-a-Caregiver/The-COPD-Caregiver.aspx); and heart failure caregiving programs from the American Heart Association (https://www.heart.org/en/health-topics/heart-failure/living-with-heart-failure-and-managing-advanced-hf/help-for-heart-failure-caregivers).

In conclusion, maintaining and improving the health status of caregivers, including their sleep health, is critical as the need for caregivers can be expected to increase with the aging population, while at the same time the availability of caregivers is expected to decrease.[26] Community supports can benefit caregivers. In addition, primary health care providers can provide information about sleep hygiene to family caregivers in order to promote the caregiver's awareness of sleep problems and improve caregiver's sleep and health.

List of abbreviations:

BRFSS	Behavioral Risk Factor Surveillance System
APR	adjusted prevalence ratio
CI	confidence interval
GED	General Educational Development

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Table 1.

Distribution of selected characteristics among 114,496 respondents[a] aged ≥18 years, by caregiving status, 2016 BRFSS

	Total		Caregivers (n=22,993)		Non-caregivers (n=91,503)	
Characteristic	**N[b]**	**% (95% CI)[c]**	**N[b]**	**% (95% CI)[c]**	**N[b]**	**% (95% CI)[c]**
Sex [d]						
Men	49,291	48.6 (47.7–49.5)	8,335	41.0 (39.0–43.1)	40,956	50.5 (49.5–51.5)
Women	65,193	51.4 (50.5–52.3)	14,655	59.0 (56.9–61.0)	50,538	49.5 (48.5–50.5)
Age group (years)						
18–24	5,776	12.6 (11.9–13.4)	882	11.1 (9.3–13.3)	4,894	13.0 (12.2–13.8)
25–34	10,736	17.3 (16.6–18.1)	1,752	15.2 (13.7–16.9)	8,984	17.8 (17.0–18.7)
35–44	13,069	16.6 (15.9–17.3)	2,471	14.2 (12.8–15.8)	10,598	17.2 (16.4–18.0)
45–64	43,418	33.8 (33.0–34.6)	10,568	40.9 (39.0–42.9)	32,850	32.0 (31.1–33.0)
≥65	41,497	19.7 (19.1–20.2)	7,320	18.5 (17.2–19.8)	34,177	20.0 (19.3–20.6)
Race/ethnicity						
Non-Hispanic white	87,567	57.9 (57.0–58.8)	17,701	62.8 (60.7–64.9)	69,866	56.7 (55.7–57.7)
Non-Hispanic black	7,816	9.8 (9.3–10.3)	1,823	11.0 (9.8–12.5)	5,993	9.5 (8.9–10.1)
Hispanic	12,942	23.2 (22.3–24.1)	2,075	19.3 (17.4–21.4)	10,867	24.1 (23.2–25.1)
American Indian/Alaska Native	2,142	1.0 (0.9– 1.2)	565	1.3 (1.0– 1.6)	1,577	1.0 (0.8– 1.1)
Other, non-Hispanic	4,029	8.1 (7.4– 8.8)	829	5.5 (4.6– 6.6)	3,200	8.7 (7.9– 9.5)
Education						
Less than high school diploma	8,734	14.9 (14.2–15.7)	1,337	11.2 (9.9–12.6)	7,397	15.8 (15.0–16.7)
High school diploma or GED	31,278	26.5 (25.8–27.3)	5,964	25.9 (24.2–27.6)	25,314	26.7 (25.8–27.5)
Some college or technical school	32,165	31.3 (30.5–32.2)	7,094	36.9 (34.7–39.1)	25,071	30.0 (29.0–30.9)
College graduate	42,319	27.2 (26.5–28.0)	8,598	26.1 (24.6–27.7)	33,721	27.5 (26.7–28.3)
Employment status						
Employed	56,462	56.8 (56.0–57.7)	11,381	55.5 (53.5–57.6)	45,081	57.2 (56.2–58.1)
Unemployed	4,655	5.7 (5.3– 6.2)	1,179	6.9 (6.0– 7.9)	3,476	5.5 (5.0– 6.0)
Retired	35,982	17.7 (17.1–18.2)	6,814	17.7 (16.5–19.0)	29,168	17.7 (17.1–18.3)
Unable to work	7,745	6.6 (6.2– 7.0)	1,731	7.6 (6.7– 8.6)	6,014	6.4 (6.0– 6.8)
Homemaker or student	9,652	13.1 (12.5–13.8)	1,888	12.3 (10.9–13.8)	7,764	13.3 (12.6–14.1)
Marital status						

Characteristic	Total N[b]	Total % (95% CI)[c]	Caregivers (n=22,993) N[b]	Caregivers (n=22,993) % (95% CI)[c]	Non-caregivers (n=91,503) N[b]	Non-caregivers (n=91,503) % (95% CI)[c]
Married	64,396	56.1 (55.2–57.0)	14,151	57.3 (55.2–59.4)	50,245	55.9 (54.9–56.8)
Divorced, separated, widowed	32,467	19.7 (19.1–20.3)	5,601	19.8 (18.4–21.3)	26,866	19.7 (19.0–20.4)
Never married	17,633	24.2 (23.3–25.0)	3,241	22.9 (21.0–25.0)	14,392	24.5 (23.6–25.4)
Body mass index (kg/m^2)						
Underweight (<18.5)	1,706	1.9 (1.7– 2.2)	316	1.8 (1.3– 2.4)	1,390	1.9 (1.7– 2.2)
Normal weigh (18.5–24.9)	34,220	31.3 (30.5–32.2)	6,493	29.5 (27.7–31.5)	27,727	31.8 (30.8–32.7)
Overweight (25.0–29.9)	39,257	32.7 (31.8–33.5)	7,742	31.4 (29.5–33.4)	31,515	33.0 (32.0–33.9)
Obese (≥30.0)	32,870	28.0 (27.2–28.9)	7,185	31.8 (29.9–33.7)	25,685	27.1 (26.2–28.1)
Missing	6,443	6.1 (5.7– 6.5)	1,257	5.5 (4.6– 6.7)	5,186	6.2 (5.8– 6.7)
Cigarette smoking status						
Current smoker	16,499	15.4 (14.8–16.1)	4,165	20.0 (18.4–21.7)	12,334	14.3 (13.6–15.0)
Former smoker	32,616	23.9 (23.1–24.6)	6,378	23.5 (22.0–25.1)	26,238	23.9 (23.1–24.8)
Never smoker	65,381	60.7 (59.9–61.6)	12,450	56.5 (54.4–58.5)	52,931	61.8 (60.8–62.7)
Leisure-time physical activity						
Yes	85,671	75.8 (75.1–76.6)	17,834	77.7 (75.9–79.3)	67,837	75.4 (74.5–76.2)
No	28,825	24.2 (23.4–24.9)	5,159	22.3 (20.7–24.1)	23,666	24.6 (23.8–25.5)
Short sleep duration (<7 hours/24hours)						
Yes	35,733	35.0 (34.1–35.8)	8,313	39.0 (37.0–41.0)	27,420	34.0 (33.0–34.9)
No	78,763	65.0 (64.2–65.9)	14,680	61.0 (59.0–63.0)	64,083	66.0 (65.1–67.0)

[a]Respondents were from the District of Columbia, Puerto Rico, and 19 states (Arizona, Arkansas, California, Connecticut, Colorado, Georgia, Minnesota, Missouri, Montana, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, South Dakota, Tennessee, Texas, Utah) that administered the caregiving module in 2016.

[b]Unweighted sample size.

[c]Weighted distribution of selected characteristics overall and by caregiving status. The sum of percentage of multiple-level variable may not be equal to 100% due to rounding.

[d]12 respondents who reported “refused to answer” for sex variable were categorized as “other”, which was not showed due to unreliable estimates in the table but were included in the analyses.

Table 2.

Age-adjusted prevalence of short sleep duration (<7 hours/24 hours) and adjusted prevalence ratio by caregiver status within selected characteristics among 114,496 adult respondents ≥18 years[a], 2016

Characteristic	Caregivers % (95% CI)[b]	Non-caregivers % (95% CI)[b]	Adjusted prevalence ratio (95% CI)[c]
Age-adjusted prevalence	39.5 (37.4–41.7)	34.2 (33.2–35.3)	1.12 (1.06–1.19)
Sex [d]			
Men	39.7 (36.4–43.1)	34.8 (33.3–36.2)	1.11 (1.02–1.22)
Women	39.2 (36.6–41.9)	33.7 (32.3–35.1)	1.13 (1.05–1.22)
Age groups (years)			
18–24	29.2 (22.3–37.3)	31.8 (28.6–35.2)	0.91 (0.69–1.20)
25–34	43.7 (38.2–49.4)	36.4 (34.0–38.9)	1.13 (0.98–1.30)
35–44	47.1 (41.6–52.6)	36.5 (34.0–39.1)	1.21 (1.06–1.38)
45–64	40.6 (37.8–43.5)	36.3 (34.6–38.0)	1.13 (1.04–1.22)
≥65	31.3 (27.9–35.0)	27.2 (25.8–28.7)	1.17 (1.04–1.31)
Race/ethnicity			
Non-Hispanic white	38.5 (35.6–41.4)	32.4 (31.3–33.6)	1.14 (1.07–1.22)
Non-Hispanic black	48.3 (42.0–54.6)	43.8 (40.6–46.9)	1.11 (0.96–1.28)
Hispanic	41.0 (36.1–46.0)	34.0 (31.8–36.4)	1.10 (0.94–1.29)
American Indian/Alaska Native	44.8 (35.0–55.2)	34.5 (28.1–41.6)	1.31 (0.99–1.73)
Other, Non-Hispanic	42.6 (34.9–50.7)	41.2 (36.6–46.1)	0.95 (0.75–1.21)
Education			
Less than high school diploma	45.8 (39.3–52.4)	32.0 (29.4–34.8)	1.30 (1.11–1.52)
High school diploma or GED	42.2 (38.7–45.7)	36.9 (35.0–38.7)	1.12 (1.01–1.24)
Some college or technical school	42.9 (39.1–46.8)	37.9 (35.9–39.9)	1.11 (1.00–1.23)
College graduate	32.7 (29.4–36.2)	29.3 (27.7–30.9)	1.05 (0.95–1.17)
Employment status			
Employed	40.8 (37.7–44.0)	35.4 (33.9–36.9)	1.16 (1.07–1.25)
Unemployed	49.0 (41.2–56.9)	35.5 (31.5–39.8)	1.20 (1.00–1.44)
Retired	54.6 (42.7–66.1)	44.4 (34.8–54.5)	1.13 (1.00–1.28)
Unable to work	48.8 (41.8–55.9)	47.5 (43.3–51.8)	0.97 (0.85–1.10)
Homemaker or student	32.4 (27.6–37.7)	28.4 (25.2–31.8)	1.01 (0.83–1.23)
Marital status			
Married	37.2 (33.5–41.1)	32.5 (30.9–34.1)	1.12 (1.03–1.21)
Divorced, separated, widowed	50.1 (43.9–56.2)	40.3 (37.1–43.6)	1.26 (1.15–1.39)
Never married	38.1 (33.9–42.5)	37.7 (35.4–39.9)	1.00 (0.87–1.15)
Body mass index (kg/m^2)			
Underweight (<18.5)	45.9 (35.9–56.2)	33.3 (26.4–41.0)	1.61 (1.13–2.30)
Normal weigh (18.5–24.9)	35.3 (32.0–38.7)	31.5 (29.8–33.3)	1.10 (0.98–1.22)
Overweight (25.0–29.9)	37.1 (33.1–41.2)	34.8 (33.0–36.7)	1.07 (0.97–1.19)
Obese (≥30.0)	42.5 (39.1–45.9)	38.5 (36.4–40.7)	1.10 (1.00–1.21)
Missing	48.5 (41.0–56.0)	30.0 (26.9–33.4)	1.50 (1.24–1.80)

Characteristic	Caregivers % (95% CI)[b]	Non-caregivers % (95% CI)[b]	Adjusted prevalence ratio (95% CI)[c]
Cigarette smoking status			
Current smoker	46.3 (41.9–50.8)	42.3 (39.8–44.8)	1.08 (0.97–1.20)
Former smoker	41.1 (35.9–46.6)	34.6 (32.2–37.1)	1.13 (1.02–1.26)
Never smoker	36.8 (34.0–39.6)	32.2 (30.9–33.5)	1.12 (1.03–1.22)
Leisure-time physical activity			
Yes	36.8 (34.5–39.2)	32.6 (31.5–33.8)	1.09 (1.02–1.17)
No	48.7 (43.3–54.2)	38.8 (36.7–41.0)	1.20 (1.08–1.33)

[a] Respondents were from the District of Columbia, Puerto Rico, and 19 states (Arizona, Arkansas, California, Connecticut, Colorado, Georgia, Minnesota, Missouri, Montana, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, South Dakota, Tennessee, Texas, Utah) that administered the caregiving module in 2016.

[b] Except for age groups, estimates were age-adjusted to the 2000 projected U.S. population aged ≥18 years. https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

[c] Adjusted prevalence ratio and 95% confidence interval (CI) were derived from multivariable logistic regression model with sex, age group, race/ethnicity, education, employment status, marital status, BMI category, cigarette smoking status, and leisure-time physical activity as covariates.

[d] 12 respondents who reported “refused to answer” for sex variable were categorized as “other”, which was not showed due to unreliable estimates in the table but were included in the analyses.

Table 3.

Age-adjusted prevalence of short sleep duration (<7 hours/24 hours) associated with duration and intensity of caregiving among 22,640 caregivers aged ≥18 years, 2016 BRFSS

Caregiving characteristic	n[a] (%)	Age-adjusted short sleep duration, % (95% CI)[b]	Adjusted prevalence ratio[c]
Number of caregiver's chronic conditions [d]			
None	7,118 (38.0)	34.5 (31.4–37.7)	1.00 (referent)
1	6,746 (30.0)	41.7 (37.6–45.8)	1.16 (1.02–1.32)
2	4,569 (17.3)	39.3 (34.8–43.9)	1.18 (1.03–1.35)
3	2,369 (8.0)	49.4 (42.5–56.4)	1.24 (1.06–1.45)
4	1,138 (4.1)	52.2 (42.3–61.9)	1.29 (1.06–1.55)
≥5	699 (2.7)	69.6 (61.5–76.6)	1.60 (1.31–1.96)
Care recipient's condition			
Major chronic condition[e]	5,285 (25.2)	42.6 (38.7–46.7)	1.15 (1.01–1.31)
Cancer	1,782 (7.2)	42.6 (36.7–48.8)	1.21 (1.02–1.43)
Dementia	2,147 (9.1)	36.8 (31.1–42.8)	1.10 (0.91–1.33)
Developmental disabilities such as autism, Down's syndrome, spina bifida	846 (4.0)	43.2 (34.8–52.0)	1.18 (0.94–1.49)
Mental illnesses, substance abuse	1,121 (6.2)	34.0 (27.1–41.7)	1.00 (0.79–1.28)
Injuries	2,517 (15.2)	37.0 (31.2–43.2)	1.07 (0.89–1.27)
Old age/infirmity/frailty	2,543 (8.8)	39.9 (32.8–47.5)	1.06 (0.89–1.25)
Other unspecified care-needed condition	5,414 (20.6)	35.6 (31.6–39.8)	1.00 (referent)
Duration of caregiving (year)			
<2	11,444 (50.2)	36.3 (33.6–39.2)	1.00 (referent)
2–<5	4,521 (19.4)	40.1 (36.0–44.4)	1.08 (0.96–1.21)
≥5	6,675 (30.4)	44.9 (40.8–49.2)	1.19 (1.06–1.32)
Intensity of caregiving (hours/week)			
<20	15,248 (69.7)	37.0 (34.5–39.7)	1.00 (referent)
20–39	2,063 (11.0)	47.2 (41.2–53.2)	1.20 (1.04–1.38)
≥40	4,136 (19.3)	43.2 (38.6–48.0)	1.13 (1.00–1.27)

[a] Unweighted sample size. Due to missing responses, the total sample size for analysis by duration of caregiving does not equal that for analysis by intensity of caregiving and percentage may not be added up to 100%.

[b] Age-adjusted to the 2000 projected U.S. population aged ≥18 years. https://www.cdc.gov/nchs/data/statnt/statnt20.pdf

[c] Adjusted prevalence ratio and 95% confidence interval (CI) were derived from multivariable logistic regression model among caregivers with sex, age group, race/ethnicity, education, employment status, marital status, BMI category, cigarette smoking status, leisure-time physical activity, number of caregiver's chronic condition, and care recipient's condition.

[d] Caregiver's chronic condition including diabetes, asthma ever, chronic obstructive pulmonary disease (COPD), coronary heart disease (heart attack, myocardial infarction or angina), stroke, arthritis, any cancer, depression, or chronic kidney disease.

[e] Major chronic condition including arthritis/rheumatism, asthma, chronic respiratory conditions such as emphysema or COPD, diabetes, heart disease, hypertension, stroke, human immunodeficiency virus infection (HIV), other organ failure or disease such as kidney or liver problems.