

# **Can Having Sex Help Your Sleep? An Investigation of Sexual Activity and Sleep among Older Adults**

**Jen-Hao Chen**  
**Howard University**  
**Email: [jenhao.chen@howard.edu](mailto:jenhao.chen@howard.edu)**

Sleep medicine considers sex as a sleep-enhancing behavior. However, no population-based study has considered the relationship between sexual activity and sleep outcomes. This study provides the first evidence on the issue using nationally representative data from the National Social Life, Health and Aging Project (N=780). Drawing from sociological literature and sleep medicine, the analysis considered partnership context and frequency of sexual activity in relation to measured sleep outcomes. Results showed that low frequency of partnered sex was associated with less sleep fragmentation and shorter wake time after sleep onset (WASO). High frequency of partnered sex and unpartnered older adults' sexual activity, however, were not associated with sleep outcomes. Additionally, the relationship between sex and sleep varied by gender. For older men, low frequency of partnered sex was associated with reduced odds of short sleep duration, less sleep fragmentation, and shorter sleep latency. For older women, low frequency of partnered sex was associated with less sleep fragmentation and shorter WASO. Findings suggest that sex per se may not promote sleep. Sexual activity seems to have a larger positive impact on men's sleep than women's sleep in later life. Context and frequency of sex shape whether and how sexual activity influences sleep.

## BACKGROUND

It is well-documented that older adults have shorter sleep duration and poorer sleep quality than young adults (Ancoli-Israel, 2009; Foley et al., 1995; Lauderdale et al., 2014). Although the exact mechanisms that lead to changes in sleep as a result of aging process remain not very clear, the decline of sleep duration and prevalence of sleep disturbances in later life can have consequences on the elderly. There is growing evidence of the importance of sleep health for older adults' well-being. Poor sleep has been linked to declines in cognitive function (Cricco, Simonsick, & Foley, 2002) and increases in diabetes (Gangwisch et al., 2007), heart disease (Phillips & Mannino, 2007), and mortality (Cappuccio et al., 2010). Poor sleep thus is increasingly recognized as not only a clinical issue but also a public health problem as sleep health has been listed as a key area in the Healthy People 2020 initiative (US Department of Health and Human Services, 2010)

Many of the recommendations on improving sleep focus on establishing proper *sleep hygiene* (defined as behaviors and practices that enhance sleep). Of various sleep-enhancing behaviors, sexual activity frequently appears in the discussion. Professional organization like the National Sleep Foundation and sleep doctors all agree that sex promotes sleep. When asking why sex matters for sleep, these recommendations often refer to one of the following reasons. First, sexual activity is considered as a physical exercise. Exercise helps sleep. Second, having sex can also lead to changes in hormones that also facilitate sleep. Because of these two reasons, sleep doctors and behavior therapists often consider sexual activity as one of the sleep-enhancing behaviors. Nevertheless, despite the wide spread of the idea that sex helps sleep, no study has considered the relationship between sexual activity and sleep outcomes using population-based data. Thus, while the physiological mechanisms that connect sex and sleep are plausible, we

have no scientific evidence on the linkage between sexual activity and sleep. The present study aims to provide the very first population-based evidence on the issue. Using innovative data from the National Social Life Health and Aging Project (NSHAP), this study empirically examine whether having sex benefits sleep of a nationally representative sample of older adults.

## INTRODUCTION

### *Limited Evidence of Sexual Activity as a Practice of Sleep Hygiene*

Modern sleep medicine emphasizes the role of sleep hygiene. Sleep hygiene is defined as “the practices that are necessary to have normal, quality nighttime sleep and full daytime alertness” (National Sleep Foundation, 2016a). These practices may include avoiding caffeine, nicotine too close to bedtime, and having a pleasant and relaxing sleeping environment, establishing a regular relaxing bedtime routine that avoid emotionally upsetting conversations and activities before trying to sleep, taking a relaxing exercise before bed to help initiate a result night’s sleep (National Sleep Foundation, 2016a). In addition to these widely known practices of sleep hygiene, having sex is frequently mentioned. A quick search of the phrase “sex helps sleep” on the Internet returns dozen of articles that describes the benefits of having sex for a good night’s of sleep. These articles make similar arguments of why sex is good for sleep. The National Sleep Foundation’s (2016b) article “Is sex helping or hurting your sleep?” provides a good example of how sleep doctors and therapists consider having sex as a practice of sleep-enhancing behavior:

*Yes, sex can actually make it easier to fall asleep. This is mostly because of the hormones that are released during the act.... If a lack of sleep is*

*hurting your sex life, the answer might lie in having more sex! That's because sexual satisfaction is a great stress reliever, as well as a way to feel more intimate with your partner—and when you feel less frazzled and happier in your relationship, those feelings will contribute to better sleep (and the cycle goes on and on!). Instead of lying in bed, worrying about why you can't fall asleep, turn to your partner and initiate sex.*

Despite the popularity of the idea that having sex promotes sleep. None of the on-line articles that encourage people having more sex as a way of sleep-enhancing behavior are supported by empirical evidence. A search of the scientific literature using the key words “sexual activity”, “sexual behavior” and “sleep” finds no study. Lack of scientific support not only undermines the validity of the sleep hygiene practice itself but also threatens the practice of sleep medicine as an evidence-based specialty in medical sciences. Because we have little evidence that if sex helps sleep, sleep doctors and therapists may end up prescribing the practice to patients that in fact does not lead to an improvement in their sleep. Hence, from the practice perspective, there is an urgent need for an empirical investigation of the relationship between sexual activity and sleep.

#### *Does Sexual Activity Really Matters for Sleep? Theories and Perspectives*

Despite the lack of scientific evidence, the mechanisms as described in on-line articles and by National Sleep Foundation suggest a plausible link between having sex and better sleep. Nevertheless, sex in human beings is not merely a reproductive behavior. The meaning of sexual activity also goes beyond physical exercise and the associated physiological changes in

hormones. In human beings, sexual activity occurs in the context of interpersonal relationships. Most often, sex occurs in intimate relationships. For couples, sexual intercourse is one of the most common activities individuals do before sleep because sleeping in the same bed facilitates sexual activities at night and the time before sleep is a private time for couples who may have work and family responsibilities during other times (Rosenblatt, 2006).

Thus, this very social nature of sexual activity points out the need to understand the consequence of having sex from a social and relational perspective and to conceptualize the consequences of sex in different relationship contexts. Decades of research and theories in sociology offer a suited conceptual framework for understanding the consequence of sexual activity on sleep. Specifically, the life course perspective on intimate relationship and the stress perspective lay out the theoretical foundation to conceptualize sex as a social activity and stressor. Both influence sleep. In the following section of this paper, I briefly summarize these three perspectives that may explain how sex affects sleep: (1) sleep hygiene perspective, (2) relational perspective, and (3) stress model.

*Sleep medicine perspective.* This perspective considers having sex as a sleep-enhancing behavior for physiological and biological reasons. Sex is a physical activity that leads to change in an individual's body. Having sex and having an orgasm are related to increased level of oxytocin and prolactin, lower level of cortisol, and boosted estrogen level. The changes of these hormones, as sleep doctors believe, help individuals' having a good night's sleep. This kind of message also appears frequently in on-line articles that advocate the benefit of sex on sleep. For example, the following excerpt from the National Sleep Foundation's (2016a) article explains clearly how physiological changes associated with having sex improves sleep:

*Sex boosts oxytocin (a hormone that makes you feel connected to your partner) and lowers cortisol (a stress-related hormone). Plus, having an orgasm releases a hormone called prolactin, which makes you feel relaxed and sleepy. All of that leads up to a nice, drowsy state that's perfect for cuddling up and falling asleep. There's an added bonus for women, which is that sex boosts estrogen levels, enhancing your REM stage and giving you deeper slumber. Don't feel left out, men. You sleep deeply after intercourse, too. In fact, there's even a French term for how quickly men fall asleep after orgasm: le petit mort*

*Relational Perspective.* For coupled adults, involvement in sexual activity goes beyond the physical pleasure of sex to include emotional closeness, availability of a confidant, and the benefits of physical security (Iveniuk et al. 2016). Similar to other types of social relationships, sexual relationship may promote health via increasing social integration and social and emotional support especially occurred among married or partnered couples (Burman and Margo-Lin 1992; Cohen 2004). All of which are important resources that promote health (Waite and Joyner 2001). Social and emotional support from spouses and partners have been linked to better sleep outcomes including less sleep fragmentation, and less wake bouts (Chen, Waite, and Lauderdale, 2015). From this perspective, for married couples, the social and psychological resources brought about by sexual relationship may benefit sleep. However, sexual activity occurs in non-partner relationship may not bring the same social and psychological resources. As such, it is expected that, for single older adults, having sex may not benefit sleep.

*Stress Model.* While having sex may provide health-promoting resources, it may also constitute a source of emotional and physical strain and demands (Walen and Lachman 2000). The demands may come from the expectations and social norms related to gender and sexual behavior. For example, cultural scripts of masculinity may encourage men to enact their

masculinity through sexual activities such as high frequency of sex and high expectation for their sexual performance (Carpenter 2015). This is consistent with the observations that men tend to report having sex more often than do women and that men are more likely than women to suffer sexual performance anxiety and take performance-enhancing drugs (Laumann, & Waite 2008; Lindau et al. 2007). Given that a large proportion of older adults, especially men, suffer some problems of sexual dysfunction and/or sexual performance anxiety (Lindau et al. 2007), the social norms of masculinity may increase older men's exposure to both emotional stress and physical demands as they try to adhere to the norms of frequent sex in the face of health challenges or sexual problems (Lindau et al. 2007). For women, excessive demands of sex from partners may reduce the pleasure and benefits from sexual activity. If couples could not maintain a satisfying sexual relationship, both can feel stressful. Many studies have showed that stress undermines sleep. The stress and conflict from excess demand of sex thus can lead to worse sleep outcomes. According to this perspective, although partnered sex is expected to bring benefits to sleep outcomes, high frequency of partnered sex may not benefit older adults' sleep.

### *The Case of Older Adults*

To understand the relationship between sexual activity and sleep, this study focuses on older adults. The elderly population provides great opportunities to examine whether and how sex helps sleep for a number of reasons. First, it is well-documented that older adults have high prevalence of problem sleep. Promoting sleep health in this population becomes a critical issue for public health policy. If practice of sleep hygiene helps older adults' sleep, it provides not only evidence to the hypothesis but also consolidate the idea of sexual activity as a sleep hygiene practice. Second, the dominant view considered the periods from adolescence to middle

adulthood as sexually active life stages. Scientific research mirrors this conception by focusing on sexual activity and behaviors on these populations. Contrary to the common belief that old age is commonly perceived as a life stage without sex, recent studies demonstrate the older adults' sexual life is vibrant. They actively pursue sexual activities and enjoy sexual pleasure. However, the consequences of sexual life in old age remains relatively unexplored. The focus on older adults, thus, broaden the literature by linking old age sexuality to other aspects of social inequality.

## **Methods**

### *National Social Life, Health, and Aging Project*

This study used data from National Social Life, Health, and Aging Project (NSHAP), a population-based, longitudinal study of health, social life, and well-being among older Americans. A nationally representative probability sample of community-dwelling individuals aged 57–85 was selected from households across the United States screened in 2004. African-Americans, Latinos, men, and the oldest-old (75–84 years at the time of screening) were over-sampled. Currently, NSHAP has two waves of data: 2005-2006 (first wave) and 2010-2011 (second wave). The second wave of data collection extended the sample to include the spouses and cohabiting partners of Wave 1 respondents. Therefore, there were Wave 2 participants for whom there were no Wave 1 data. Partners were eligible to participate in the NSHAP second wave of data collection if they were at least 18 years of age and resided in the household with the Wave 1 respondent at the time of the second wave interview.

For the second wave of data collection, approximately one-third of the primary respondents were randomly selected to participate in an additional activity and sleep study. Of



1117 selected individuals, 897 agreed (220 refused) to participate. After agreeing to participate, respondents were recontacted to arrange to have a wrist actigraph and a booklet on activity and sleep booklet mailed to them. These collect information about the respondent's activity levels and sleep over three full days (72 hours total). Taken together, data collected from actigraph and sleep booklet provided rich information of sleep characteristics in a representative sample of older adults. In total, 819 individuals were successfully recontacted and completed the activity study. After excluding 39 individuals with no useable actigraph data, the activity study yielded a sample of 780 individuals with at least one night of actigraphy data.

### *Measures of Sleep Outcomes*

Sleep measures were derived from the actigraphy data in Wave 2 (Lauderdale et al., 2014). The Actiwatch (Philips/Respironics 2010) records intensity and frequency of movement using a piezoelectric linear accelerometer with 15-second epochs. The Actiwatch continually registers wrist movements, and the sum of all wrist movements during each epoch is saved as an activity score. Participants were instructed to wear the watch for three full days. Data from the Actiwatch were downloaded and analyzed using the manufacturer's Actiware software version 5.59 (Philips/Respironics 2010). This study used the manufacturer's recommended settings for the software. Following the convention in the sleep literature, I took three-night average of following actigraph-estimated sleep characteristics: (1) actigraphic sleep duration (defined as the total duration of all epochs scored as sleep within the major sleep interval—i.e., the time from the first epoch scored as sleep to the last epoch scored as sleep for the primary sleep interval in each 24-hour period), (2) a sleep fragmentation index ranging from 0–100 that indicates sleep disruption as the sum of two percentages: the percentage of the sleep interval spent moving and

the percentage of immobile periods (i.e., contiguous epochs with no movement) that are no longer than one minute, (3) wake after sleep onset (WASO, defined as the total minutes awake during the sleep interval), and (4) sleep latency (defined as the amount of time it takes an individual to fall asleep initially after she or he begins to try falling asleep). Public health research has considered short sleep duration (< 6 hours) as a risk factor for health and mortality (cite). I thus transformed actigraphic sleep duration into a binary indicator of short sleep duration. Sleep fragmentation, wake after sleep onset can be considered as actigraph-estimated sleep quality indicators and all relate to the consolidation of sleep during the main sleep period. , Sleep latency is an indicator of older adults' ability to initiate sleep.

#### *Measure of Sexual Activity*

Another innovative feature of the NSHAP is the rich information of sexual activities. First, NSHAP includes a basic measure of whether a respondent was sexually active with a partner. This was based on the question asking whether the respondent had sex with the partner in the last year (1 = yes, 0 = no). Sex was defined as any “mutually voluntary activity with another person that involves sexual contact, whether or not intercourse or orgasm occurs” (Lindau et al. 2007). Second, NSHAP included question of sexual frequency based on the question asking respondents how often they had sex with the partner during the last 12 months. The responses categories were: none, about once a month, two-to-three times a month, and once a week or more. I defined about once a month and two-to-three times a month as low frequency and once a week or more as high frequency. Using the information, I created a categorical variable that combined respondents' partnership status, being sexually active, and sexual frequency. Each respondent was assigned into one of the following category: (a) no partner, not

sexually active, (b) no partner, sexually active, (c) partnered, not sexually active, (d) partnered, low sexual frequency, (e) partnered, high sexual frequency. For convenience, I rereffed this variable as sexual relationship in the following section.

### *Statistical Strategy*

I began with weighted descriptive statistics of 780 older adults in the NSHAP sample with actigraphy. Next, I examined the relationship between neighborhood social processes and *average sleep characteristics* and *sleep variability* using ordinary least squares regressions accounting for NSHAP's complex survey design. Finally, I added a series of interaction terms to investigate if the relationships between neighborhood social processes and sleep vary by living arrangements. All regressions adjusted for age, gender, race/ethnicity, education, household income, retirement status, self-rated health and self-rated mental health. With respect to missing values, I used multiple imputation to account for potential biases resulting from missing data in the control variables. Multiple imputation involves replacing missing values with predictions based on other observed variables using a Monte Carlo technique (Rubin, 1987). In contrast to single imputation, which replaces each missing value with a predicted value, multiple imputation replaces several missing values with a repeated imputation inference, creating several complete datasets. The use of multiple imputation data produces better estimates of the missing values that create uncertainty around the missing data (Allison, 2001; Hawkey et al., 2014).

## **RESULTS**

Table 1 shows descriptive statistics of older adults in the NSHAP sleep study by type of sexual relationship. Table 1 shows the social and demographic characteristics vary substantially. For partnered older adults, those who were sexually active were younger, more educated, less

likely to be retired, and rated higher in physical and mental health. The differences in social and demographic characteristics between older adults with low frequency of sexual activity and older adults with high frequency of sexual activity were small. For older adults without a partner, I did not observe many differences between those who were sexually active and those who were not. Single older adults who were sexually active were older, had lower income. However, the two groups were not different very much in terms of self-rated physical and mental health.

Table 2 show results of regressions that regressed sleep outcomes on types of sexual relationship controlling for social and demographic characteristics for the full sample. Because short sleep duration was a dummy variable, odds ratio and 90% confidence interval were presented. For all other sleep outcomes, coefficients and standard errors were reported. The results show that sexual relationship was not associated with short sleep duration and sleep latency. However, sexual relationship was related to sleep fragmentation and WASO (proxies of sleep consolidation). Specifically, partnered older adults with low frequency of sex was associated with less sleep fragmentation and shorter WASO compared to partnered older adults without sex. In addition, I also found that single, not sexually active older adults had shorter WASO compared to partnered, sexually active older adults.

Table 3 and Table 4 provides the results by men and women separately. The two tables suggest that sexual relationship was associated with men's and women's sleep in different manners. For men, Table 3 shows that low frequency of sexual activity was associated with reduced odds of short sleep duration, decreases in level of sleep fragmentation, and shorter sleep latency. It appears that having sex occasionally was associated with better sleep outcomes in men for all three dimensions (i.e., duration, consolidation, and initiation) of sleep measured in this study. For women, the patterns were different. Low frequency of sexual activity was associated

with less sleep fragmentation and shorter WASO. However, no association between sexual activity and sleep duration and latency was found for women.

## **DISCUSSION**

Although common belief and sleep medicine views sex is beneficial for one's sleep, the actual relationship between having sex and sleep outcomes is not empirically examined in the scientific literature. This study drew theories and perspectives from sociology and sleep medicine to conceptualize sexual activity within the context of intimate relationship. In addition, this study relied on innovative data from the NSHAP to provide the first population-based evidence of the association between sexual activity and measured sleep outcomes among older adults.

There are several key findings. First, I find that sexually active older adults had better sleep quality. However, the associations were only significant for partnered older adults but not single older adults. This suggests that relationship context plays a critical role in the role of sexual activity on sleep outcomes. Second, among partnered older adults, I found that those with low frequency of sexual activity had the best sleep outcomes. Low frequency of sex was associated with less sleep fragmentation and shorter WASO. Nevertheless, I did not find evidence that older adults with high frequency of sex slept better than older adults who did not have sex in the past year. This suggests that while occasional sex may bring benefits for sleep, having sex too frequently may be detrimental to sleep outcomes. This result is in contrast with the perspective from sleep medicine and common belief as the benefits of sexual activity on sleep did not increase monotonically with increased frequency. It also suggests that sexual

activity cannot be conceptualized as a type of physical exercise as other physical activities because the health benefits of exercise usually increase with the frequency of exercise. Finally, this study found gender differences in the associations between sex and sleep. Sexual activity was associated with decreased risk of short sleep duration, less sleep fragmentation, and shorter sleep latency for men whereas having sex was associated with less sleep fragmentation and shorter WASO for women. Thus, sex was associated with better sleep outcomes in three dimensions: sleep duration, sleep consolidation, and sleep initiation. For women, sex was only associated with sleep consolidation. This finding is consistent with prior studies that men's health appears to benefit more from sexual activity than women's health (Liu, Waite, Shen .& Wang, 2016).

Several limitations of this study should be considered. First, the empirical analysis focused on older adults. Findings from this study cannot extend to younger adults. Although the theoretical perspectives discussed in this paper apply to all ages, some of the patterns may be different when analyzing data of younger adults. Future studies can shed light on the issue between sex and sleep by extending the empirical investigation to individuals across age. Second, the relative small sample size of sexually active single older adults precluded additional analysis of the relationship between frequency of sexual activity and sleep among older adults in this group. Future studies with larger sample size may help answer this question. Finally, various biological, social, and behavioral mechanisms underlie the link between sex and sleep. Future studies can contribute to the issue by identifying the precise mechanisms and processes through which sex affects sleep outcomes.

Despite the widely spread of the belief that sex helps sleep, scientific evidence on the link between sexual activity and sleep outcomes is very limited. This sends a warming message to the

sleep scientists and the general public as many of the advice of sleep-enhancing behaviors are not supported by scientific evidence. This study provide first generalizable population-based evidence of linkages between sexual activity and sleep among single and partnered older adults. I found that sex matters for sleep among partnered older adults. Low frequency of sex appears to benefit sleep for older men with partners. Findings from this study challenges the idea of uniform health benefits of sexual activity on sleep, and the role of sex as a universal sleep-enhancing behavior. These findings also imply that practice of sleep hygiene needs to be considered within the relationship context. Sleep medicine can benefit from considering how social relationships and contexts influence sleep and the practice of sleep-enhancing behaviors.

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Table 1: Descriptive Statistics of Older Adults in the Activity and Sleep Supplement of the National Social Life, Health and Aging Project (N=780)

	No partner, not sexually active	No partner, sexually active	Partnered, not sexually active	Partnered, low frequency sex	Partnered, high frequency sex
	Mean or proportion	Mean or proportion	Mean or proportion	Mean or proportion	Mean or proportion
Age	71.36	76.01	74.90	67.26	64.46
Female	0.56	0.45	0.75	0.46	0.60
0.58Race/ethnicity					
White	0.90	0.82	0.78	0.81	0.78
Black	0.04	0.10	0.10	0.08	0.09
Hispanic	0.05	0.04	0.08	0.05	0.15
Others	0.02	0.04	0.03	0.06	0.01
Education					
<High school	0.17	0.12	0.16	0.10	0.09
High school	0.35	0.30	0.36	0.25	0.22
Some college	0.27	0.32	0.36	0.35	0.45
College	0.21	0.26	0.13	0.30	0.24
Income	544565	47366	30042	87950	85624
Retirement status	0.71	0.78	0.75	0.65	0.60
Self-rated health					
Poor	0.09	0.09	0.13	0.18	0.25
Fair	0.29	0.27	0.35	0.42	0.26
Good	0.34	0.45	0.28	0.28	0.36
Very good	0.19	0.20	0.18	0.11	0.13
Excellent	0.08	0.00	0.08	0.10	0.00
Self-rated mental health					
Poor	0.13	0.13	0.25	0.23	0.26
Fair	0.38	0.38	0.32	0.43	0.42
Good	0.40	0.43	0.29	0.27	0.22
Very good	0.08	0.03	0.12	0.07	0.10
Excellent	0.02	0.03	0.01	0.00	0.00

Sample size	224 (29%)	61 (8%)	170 (22%)	232 (30%)	93 (12%)

Table 2: Coefficients of Sexual Activity Predicting Sleep Outcomes

	Short sleep duration Odds ratio (90% CI)	Fragmentation Coef. (SE)	WASO Coef. (SE)	Latency Coef. (SE)
Partnered, not sexually active (ref)				
No partner, not sexually active	1.00 (.57 1.78)	-.59 (.944)	<b>-6.26 (3.17)†</b>	.11 (5.28)
No partner, sexually active	1.48 (.60 3.62)	-.13 (1.37)	-1.95 (5.44)	2.59 (7.67)
Partnered, low frequency sex	.65 (.38 1.11)	<b>-2.35 (.75)**</b>	<b>-8.92 (2.94)**</b>	-5.94 (5.09)
Partnered, high frequency sex	.70 (.28 1.71)	-.79 (1.26)	-6.93 (4.45)	-1.81 (4.93)

Note. † P<.1, \* P<.05, \*\* P<.01. All regression were weighted and controlled for age, gender, race/ethnicity, education, household income, retirement status, living arrangements, self-rated physical health, and self-rated mental health.

Table 3: Coefficients of Sexual Activity Predicting Sleep Outcomes for Men

	Short sleep duration Odds ratio (90% CI)	Fragmentation Coef. (SE)	WASO Coef. (SE)	Latency Coef. (SE)
Partnered, not sexually active (ref)				
No partner, not sexually active	<b>0.37 (.14 .96)†</b>	-2.41 (1.88)	-7.76 (7.58)	-4.85 (8.81)
No partner, sexually active	0.53 (.17 1.69)	-1.31 (2.25)	-5.62 (9.63)	1.78 (0.21)
Partnered, low frequency sex	<b>0.29 (.09 .94)†</b>	<b>-4.23 (1.97)*</b>	-12.05 (8.39)	<b>-13.23 (8.00)†</b>
Partnered, high frequency sex	<b>0.14 (.03 .71)*</b>	-3.36 (2.35)	-11.59 (8.53)	-13.46 (9.78)

Note. † P<.1, \* P<.05, \*\* P<.01. All regression were weighted and controlled for age, gender, race/ethnicity, education, household income, retirement status, living arrangements, self-rated physical health, and self-rated mental health.

Table 4: Coefficients of Sexual Activity Predicting Sleep Outcomes for Women

	Short sleep duration Odds ratio (90% CI)	Fragmentation Coef. (SE)	WASO Coef. (SE)	Latency Coef. (SE)
Partnered, not sexually active (ref)				
No partner, not sexually active	1.59 (.66 3.82)	-.65 (.90)	<b>-8.95 (2.92)**</b>	2.50 (4.76)
No partner, sexually active	3.39 (.94 12.21)	-.844 (1.56)	-.88 (6.41)	-3.01 (6.44)
Partnered, low frequency sex	0.35 (.08 1.51)	<b>-2.51 (.93)*</b>	<b>-8.46 (2.76)**</b>	-7.09 (6.67)
Partnered, high frequency sex	1.83 (.61 5.51)	-.60 (1.25)	-7.16 (4.93)	1.99 (7.39)

Note. † P<.1, \* P<.05, \*\* P<.01. All regression were weighted and controlled for age, gender, race/ethnicity, education, household income, retirement status, living arrangements, self-rated physical health, and self-rated mental health.