# Social Connectedness and Older Adults' Sleep

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## Abstract

Sleep complaints are common among older adults, and sleep duration and quality have been found to predict health outcomes; sleep is increasingly considered a behavioral risk factor for chronic diseases. In this study, we examined the effects of older adult's interpersonal network and community participation on their sleep. Aging strongly influences the social network and community involvement, both of which are beneficial for healthy aging. We used data from the National Social Life, Health, and Aging Project, a nationally representative sample of non-institutionalized older Americans aged 62-91 that included objective data on sleep duration and quality. Results suggested that only one network characteristic, total size, was associated with sleep, and it was a negative correlation with duration. In contrast, greater community involvement was correlated with two quality indicators: less time awake after sleep onset and less sleep fragmentation. Community involvement at old ages may promote better sleep quality.

## Introduction

The social connectedness of older adults is a salient issue in the rapidly aging society. Close connections to social groups and communities provide material and social support, a sense of belonging, and access to information that can be crucial for health and well-being. However, aging may challenge older adults' social integration. Older ages are often depicted as a socially isolated stage and a time of loneliness. Research has shown that older adults often have smaller networks and more primary ties (Cornwell, Laumann, and Schumm 2008; McPherson, Smith-Lovin, and Brashears 2006). While social networks are essential to older adults' social connectedness, community involvement and civic engagement are also key to social integration. Contrary to the decline of older adults' network, prior studies suggest that older adults are more involved in their communities than are younger adults, particular volunteering and religious participation (Cornwell and Harrison 2004). The divergent impacts of life-course transitions on different forms of social connectedness not only challenge the image of old age as a time of loneliness but also pose important questions their health consequences.

Motivated by this concern, the aim of this study is to examine the influence of social connectedness on older adults' sleep. While sleep is an important health behavior with consequences for health and functioning, it has received relatively little attention from social scientists. This appears to have changed recently; in a series of papers, Burgard and colleagues show that those with strained family relationships report more sleep problems (Ailshire and Burgard 2012), and differences in family responsibilities generate substantial gender gaps in sleep outcomes, including more interrupted sleep and longer self-report sleep duration in women (Burgard 2011; Burgard and Ailshire 2009,

2013). While these studies offer considerable insight into the role of the family in sleep, the implications of social connectedness on sleep, especially older adults' sleep, have yet to be adequately explored. Sleep disorders and complaints about sleep are more common among older adults (Neikrug and Ancoli-Israel 2010) and poor sleep at older ages has been linked to various adverse cognitive and physical outcomes (Brassington, King, and Bliwise 2009; Faubel et al. 2009; Phillips and Mannino 2007). Given changing patterns of social integration among older adults and the importance of sleep in shaping older adults' health and well-being, it is important to examine the relationship between older adult's sleep as related to later-life transitions in social connectedness.

Our goal here is to provide one of the first systematic analyses on social connectedness and older adults' sleep. Nationally-representative data that include both information on older adults' social network and community engagement and sleep are scarce. Notably, our data include objectively measured sleep characteristics. Specially, we focus on two forms of social connectedness—network positions and associational involvement. We also examine the influence of social connectedness on several objective sleep measures that assess both duration and quality.

## Data

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

The National Social Life, Health, and Aging Project (NSHAP) is a population-based, longitudinal study of health, social life, and well-being among older Americans (Waite et al., 2010). A nationally-representative probability sample of community-dwelling individuals aged 57-85 was selected from households across the U.S. screened

in 2004. African-Americans, Latinos, men and the oldest-old (75-84 years at the time of screening) were over-sampled. The first wave of data collection was conducted in 2005-2006 and the second wave was conducted in 2010-2011. The second wave of data collection also extended the sample to include the spouses and cohabiting partners of Wave 1 respondents. Partners were eligible to participate in NSHAP second wave if they resided in the household with the Wave 1 respondent at the time of the second wave interview and were at least 18 years of age. This yielded a total of 3,377 individuals (1,539 men and 1,838 women) with completed Wave 2 interview data.

For the second wave of data collection, 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. A wrist actigraph and activity and sleep booklet then were mailed to each participant to collect information about the respondent's activity levels over three full days (72 hours total). Eventually, 819 individuals completed the activity study. After excluding 39 individuals with no useable actigraph data, the activity study yielded a sample of 780 individuals with completed actigraphy data. Among these 780 individuals, 53 of the spouses or partners were younger than 62 or older than 90 and thus not representative of adults in the target age range; these individuals were excluded from the statistical analyses. As a result, the present study includes data from 727 individuals aged 62 to 90. Detailed socio-demographic data on individuals were obtained from the Wave 2 master files and linked to the corresponding actigraphy data.

*Measures*

*Actigraph-estimated sleep characteristics*. The objective sleep measures were derived from the actigraphy data. 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. Data from the Actiwatch were downloaded and analyzed using the manufacturer's Actiware software version 5.59 (Philips/Respironics 2010). In the present study, we focused on four actigraph-estimated sleep characteristics: (1) total sleep time (defined as the total duration of all epochs scored as sleep within the major sleep interval, that is the time from the first epoch scored as sleep to the last epoch scored as sleep for the primary sleep interval in each 24 hours, (2) percent sleep (defined as the percent of the sleep interval that is actual sleep), (3) sleep fragmentation index ( ranging from 0-100), an indicator of sleep disruption that is 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), and (4) wake after sleep onset (WASO, defined as the total minutes awake during the sleep interval). Percent sleep, sleep fragmentation, and wake after sleep onset can be considered as actigraph-estimated sleep quality indicators.

*Network characteristics*. NSHAP adopted the *name generators* approach to collect egocentric network data (Marsden 1990). The network information was collected from all respondents. Each respondent was asked the following questions: "From time to time, most people discuss things that are important to them with others. For example, these may include good or bad things that happen to you, problems you are having, or

important concerns you may have. Looking back over the past 12 months, who are the people with whom you most often discussed things that were important to you?" Respondents could name up to five persons. Respondents were also asked to describe their nature of relationship (i.e., friend, relative, and so on). These persons were recorded in Roster A (i.e., core confidantes). Roster B, C, and D captured respondents' other important network members. When respondents who had a spouse or partner and did not include that person in Roster A, that individual would be listed in Roster B. Next, respondents were asked: "Besides the people you already listed, is there anyone else who is very important to you, perhaps someone with whom you feel especially close?" If so, the person was added to Roster C. Finally, any remaining household members not listed in Roster A, B, C was recorded in Roster D.

This study used network information provided by respondents to construct four network characteristics. The first measure is *network size*. Here we focused on numbers of person listed in Roster A because it captured the extent to which a person has the strong types of social ties that are most likely to provide social support. Second, we focused on *network density* which is defined as the proportion of all possible pairs among the alters in which the two individuals know each other. Network density ranges from 0 to 1. The third measure is proportion who are *kin*. The focus on kin relations is driven the fact that they are the most likely to provide unconditional support in the face of health crises (Haines and Beggs 2000). Because we knew each alter's relationship with ego, we could calculate the proportion of kin listed in the respondent's core discussion network. Finally, Respondents were asked about the frequency they contacted people in the core discussion network. Answer categories ranged from "once a year" to "every day". We

summed up the total volume of contact for all persons listed in the core discussion network on a yearly scale where “once a year” was counted as 1 and “every day” was counted as 465. Next, we created a measure of *average daily volume of contact with network members* by dividing the total volume of contact by 365.

*Community Involvement*. Respondents were asked about (1) how often they attended religious services in the past 12 months, (2) how often they did volunteer work in the past 12 months, (3) how often attended meetings of an organized group in the past 12 months. Answer categories ranged from “never” (coded as 0) to “several times a week” (coded as 6). Exploratory factor analysis suggests that these three variables loaded into a common factor. We thus created a summary score of respondent’s community involvement by summing up all items. The reliability of the score was 0.71.

*Covariates*. Respondent’s education was categorized as less than high school, high school or equivalent, some college education, bachelor’s degree or higher. Race and ethnicity distinguished white, African American, Hispanic, and Other. Two dichotomous variables indicated whether the respondent was retired or widowed at the time of the interview. Log household income was used as indicators of respondents’ economic standing. A frailty score measured respondent’s functional status and a CESD scale indicated respondent’s depression symptoms. We also controlled for gender and age.

## Results

### *Descriptive Statistics*

Table 1 provides the weighted descriptive statistics. As the table shows, the average number of contacts listed in respondent’s core discussion network was 4.82 and the average volume of contact was approximately 2.34 times per day. The average

network density (ranging from 0 to 1) was 0.71 and the average proportion of kin (ranging from 0 to 1) was 0.66. As expected, older adults have more primary ties and have close network. About two third of people listed in the core discussion network were kin. The average involvement in associations scale was 8.18 (ranging from 0-18). With respect to actigraph-estimated sleep characteristics, the average duration of actual sleep time was 435 minutes (or 7.25 hours). The mean sleep fragmentation index was 14 percent, mean WASO was 39 minutes, and the mean number of wake bouts was 46.

With respect to social and demographic, the average age of respondents in the sample was approximately 72 years old. About 54% were female. Eighty three percent of the sample were White, 7% Black, 6% Hispanic, and 4% others. About 14% of respondents did not complete high school, 30% had high school diploma, 34% had some college education, and 22% received a bachelor degree or more. Majority of the older adults (74%) were retired and 20% were widowed. With respect to functional status and mental health, the mean frailty score was 0.94 and mean CESD score was 3.94.

*Regression Results*

Table 2 presents results of OLS models regressing objective sleep outcomes on interpersonal network characteristics. All models controlled for previously described covariates. Our estimates showed that social network characteristics were not associated with most objective sleep measures. The only exception was network size, which was negatively correlated with sleep duration. Contrary to our expectations, older adults with larger networks, denser networks, and more frequent contacts with network members did not show more favorable objective sleep quality outcomes. It is worth noting that while

less fragmentation, fewer wake bouts and fewer minutes of WASO are unambiguously interpretable as better sleep quality, it should be noted that sleep duration is more complicated. Both ends of the distribution (long and short sleep durations) have been associated with worse health. As such, it is less clear that whether the negative correlation between network size and sleep duration should be viewed as a negative result.

Table 3 presents estimates of the associations between community involvement and actigraphic sleep measures. Community involvement was not associated with older adults' sleep duration and number of wake bouts. However, older adults' participation of community organizations was associated with fewer minutes of WASO and less sleep fragmentation. The relationships remained strong after controlling for older adults' functional status and mental health. Results suggest that community involvement at older ages may promote good sleep. Further analysis suggests that religious services participation and volunteering each was significantly associated with WASO and sleep fragmentation. However, organized group participation has little impact on actigraphic sleep outcomes. As such, the associations between community involvement and objective sleep outcomes were primarily due to the participation of religious and volunteering activities.

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**Table 1: Description of Variables Used in the Analysis (N=780)**

| Variable | Description | Mean (SD) |
|---|---|---|
| Interpersonal Network | | |
| Network size | Number of people listed in respondent's core discussion network | 4.82 |
| Network density | Proportion of network members that know each other | 0.71 |
| Proportion kin | Proportion of kin of people listed in the core discussion network | 0.66 |
| Volume of contact | Daily frequency that respondent's contact people listed in the discussion network ( = overall contact volume/365) | 2.34 |
| Associational Network | | |
| Community involvement scale (0-21) | Sum of the frequency of (1) religious services attendance, (2) volunteer work, and (3) involvement in organized group | 8.18 |
| Objective Sleep Measures | | |
| Sleep duration (minutes) | The total duration of all of the epochs scored as sleep during the sleep interval | 435 |
| Wake after sleep onset (WASO, minutes) | The minutes awake during the sleep interval | 39.07 |
| Number of wake bouts | Number of wake bouts during the sleep interval | 46.15 |
| Sleep fragmentation (0-100) | An index of sleep disruption | 14.36 |
| Social Demographic Characteristics | | |
| Age | | 71.79 |
| Female | | 0.54 |
| Race and ethnicity | | |
| White | | 0.83 |
| Black | | 0.07 |
| Hispanic | | 0.06 |
| Other | | 0.04 |
| Education | | |
| <High school | | 0.14 |
| High school | | 0.30 |
| Some college | | 0.34 |
| Bachelors and more | | 0.22 |

| | |
|---|---|
| Retirement | 0.74 |
| Widowed | 0.20 |
| Frailty Scale (0-4) | 0.94 |
| CESD (0-30) | 3.94 |

**Table 2: OLS Regression Models of Regressing Interpersonal Network Properties on Objectively-Measured Sleep Characteristics (N=780)**

| | Sleep Duration (minutes) | WASO (minutes) | Wake Bouts | Fragmentation |
|---|---|---|---|---|
| Network size | -6.72* | -0.84 | -0.98 | -0.16 |
| | (2.78) | (0.85) | (0.74) | (0.23) |
| Network density | -3.68 | -3.29 | -4.72 | -0.91 |
| | (13.65) | (3.66) | (3.29) | (0.95) |
| Proportion kin | -13.27 | 5.39 | 5.89 | 1.21 |
| | (12.85) | (5.94) | (5.38) | (1.51) |
| Volume of contact | 5.24 | 0.20 | 0.51 | -0.02 |
| | (3.19) | (1.15) | (1.08) | (0.31) |
| Age | 0.83 | 0.03 | -0.04 | 0.03 |
| | (0.49) | (0.11) | (0.13) | (0.04) |
| Female | 26.41** | -0.64 | -5.74 | -1.43** |
| | (7.71) | (1.68) | (1.94) | (0.46) |
| Race and ethnicity | | | | |
| Black | -15.71$^{+}$ | 9.19** | 8.28* | 2.51** |
| | (8.63) | (3.14) | (3.15) | (0.67) |
| Hispanic | -3.57 | 0.33 | -1.04 | 0.19 |
| | (9.88) | (3.57) | (3.03) | (0.67) |
| Other | -54.33$^{+}$ | -2.63 | -0.51 | 1.76 |
| | (28.83) | (3.79) | (5.03) | (1.86) |
| Education | | | | |
| High school | -16.67 | -9.58* | -6.80$^{+}$ | -1.24 |
| | (10.58) | (4.08) | (3.87) | (0.81) |
| Some college | -16.90 | -8.95* | -6.15$^{+}$ | -0.73 |
| | (10.92) | (4.6) | (3.54) | (0.94) |
| Bachelors or more | -7.8 | -10.24** | -8.19* | -1.40 |
| | (11.36) | (3.62) | (3.51) | (0.83) |
| Log income | 2.81 | -1.10 | -0.30 | -0.45 |
| | (4.84) | (1.12) | (1.35) | (0.31) |
| Retirement | 14.62$^{+}$ | -0.47 | 0.12 | -0.43 |
| | (8.51) | (2.23) | (1.91) | (0.63) |
| Widowed | -0.49 | 7.07* | 2.22 | 0.85 |
| | (10.67) | (2.74) | (2.47) | (0.65) |
| Frailty scale | -1.13 | 2.63* | 1.67 | 0.77* |
| | (4.60) | (1.21) | (1.06) | (0.30) |
| CESD | -0.47 | 0.15 | 0.13 | 0.08 |
| | (0.63) | (0.20) | (0.20) | (0.05) |

Note.* $p<.05$; **$p<.01$; *** $p<.001$.

**Table 3: OLS Regression Models of Regressing Associational Network on Objectively-Measured Sleep Characteristics (N=780)**

| | Sleep Duration (minutes) | WASO (minutes) | Wake Bouts | Fragmentation |
|---|---|---|---|---|
| Community involvement scale | -0.03 (0.69) | -0.40* (0.16) | -0.27 (0.18) | -0.11* (0.04) |
| Age | 1.04* (0.50) | 0.05 (0.12) | -0.02 (0.13) | 0.04 (0.04) |
| Female | 25.75** (7.10) | -0.85 (1.69) | -5.93** (1.83) | -1.47** (0.45) |
| Race and ethnicity | | | | |
| Black | -15.70$^{+}$ (8.83) | 9.78** (2.95) | 8.94** (3.03) | 2.61*** (0.66) |
| Hispanic | -3.97 (10.02) | 0.32 (3.48) | -1.00 (3.03) | 0.16 (0.62) |
| Other | -56.36* (27.55) | -2.16 (4.03) | -0.31 (4.96) | 1.88 (1.90) |
| Education | | | | |
| High school | -16.25 (10.76) | -8.95* (3.98) | -6.48$^{+}$ (3.75) | -1.01 (0.83) |
| Some college | -17.00 (11.02) | -7.94$^{+}$ (4.06) | -5.61 (3.54) | -0.37 (0.98) |
| Bachelors or more | -8.62 (10.97) | -8.88* (3.51) | -7.46* (3.34) | -0.94 (0.86) |
| Log income | 2.21 (4.75) | -1.13 (1.05) | -0.25 (1.33) | -0.48 (0.31) |
| Retirement | 13.16 (8.68) | -0.28 (2.22) | 0.12 (1.93) | -0.36 (0.63) |
| Widowed | 0.17 (11.61) | 6.76* (2.58) | 1.74 (2.18) | 0.82 (0.62) |
| Frailty scale | -0.99 (0.64) | 2.48* (1.24) | 1.58 (1.09) | 0.72* (0.31) |
| CESD | -0.49 (0.64) | 0.19 (0.20) | 0.16 (0.20) | 0.09$^{+}$ (0.05) |

Note.* $p<.05$; **$p<.01$; *** $p<.001$.