

# Purpose in life and incidence of sleep disturbances

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**Abstract** Purpose in life has been linked with better mental health, physical health, and health behaviors, but the association between purpose and sleep is understudied. Sleep disturbances increase with age and as the number of older adults rapidly increases, it is ever more important to identify modifiable factors that are associated with reduced incidence of sleep disturbances. We used multiple logistic regression models and data from the Health and Retirement Study, a nationally representative panel study of American adults over the age of 50, to examine whether higher purpose was linked with a reduced incidence of sleep disturbances. Among 4144 respondents reporting minimal or no sleep disturbances at baseline, higher purpose was associated with a lower incidence of sleep disturbances over the 4-year follow-up. After adjusting for sociodemographic factors, each unit increase in purpose (on a six-point scale) was associated with a 16 % reduced odds of developing sleep disturbances (OR 0.84, 95 % CI 0.77–0.92). The association between purpose and sleep disturbances remained after adjusting for sociodemographic, behavioral, psychological, and health covariates. Should future research replicate our findings, this area of research may lead to innovative efforts that improve the quality of sleep in older adults.

**Keywords** Purpose in life · Meaning in life · Well-being · Sleep · Sleep disturbance

## Introduction

Healthy sleep is necessary for optimal immune functioning, metabolism, thermoregulation, and processes related to the cardiovascular and respiratory systems (Siegel, 2005). Sleep disturbances, however, are associated with higher rates of health problems, mental illnesses, cognitive impairment, and death (Ancoli-Israel, 2009; Foley et al., 2004). Sleep disturbances as indicated by difficulty falling asleep, staying asleep, waking too early, or not feeling well rested upon awakening, closely align with the criteria for insomnia (American Academy of Sleep Medicine, 2014). Disturbed sleep has a particularly profound impact on the older adult population—between 40 and 70 % of older adults report symptoms of insomnia, disrupted sleep, or inadequate sleep (Ganguli et al., 1996; Jaussent et al., 2011). By 2050, the number of U.S. adults over the age of 65 is estimated to double, and this demographic shift is occurring in developed nations throughout the world (Vincent & Velkoff, 2010; National Institute on Aging, n.d.). Given our rapidly aging population, both the number of people impacted by sleep disturbances and the number of medical and psychiatric comorbidities associated with sleep disturbances will likely rise. Identifying novel factors associated with reduced incidence of sleep disturbances may lead to innovative strategies that ameliorate sleep problems.

While considered by philosophers for over two millennia, purpose in life is a factor that has been of recent scientific interest. The definition of purpose in life somewhat varies among researchers, but it is typically conceptualized

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as a person's sense of directedness and sense of meaning in his or her life (Dik et al., 2013; Heintzelman & King, 2014; McKnight & Kashdan, 2009; Steger, 2009; Ryff, 2014). The construct is a central component to well-being and fulfillment (Dik et al., 2013; Heintzelman & King, 2014; McKnight & Kashdan, 2009; Steger, 2009; Ryff, 2014). An emerging body of research shows that purpose is linked with a variety of healthy behaviors, positive health outcomes, and longevity (Roepke et al., 2014; Ryff, 2014). For example, greater purpose has been longitudinally linked with a reduced risk of Alzheimer's disease, stroke, and heart attack (Boyle et al., 2010; Kim et al., 2013a, 2013b; Krause, 2009; Roepke et al., 2014). Purpose in life is shaped by social influences and intervention trials suggest that purpose can be deliberately and systematically enhanced (Burrow & Hill, 2011; Hill et al., 2013; Ruini & Fava, 2012; Ryff, 2014; Van der Spek et al., 2014).

### Past research on purpose and sleep

There has been little research examining the association between purpose and sleep. We are aware of four studies that have examined this topic. A cross-sectional study of 736 British civil servants showed that higher scores on a eudemonic well-being scale (which captured aspects of control, autonomy, and self-realization) was associated with fewer sleep problems, even after adjusting for negative psychological states and a range of other factors (Steptoe et al., 2008). In a second study, a cross-sectional examination of 502 middle-aged adults showed that lower purpose was associated with suboptimal sleep duration (inadequate or excessive hours) after adjusting for demographic factors and after excluding depressed people from the analyses (Hamilton et al., 2007). A third study also used a cross-sectional design and examined data from 135 older women and showed that women with higher purpose showed less body movement during sleep—a potential marker of better sleep quality (Ryff et al., 2004). Finally, in a study of 115 older women, researchers statistically identified subgroups of people that showed different trajectories of sleep quality over time (Phelan et al., 2010). All subgroups showed declining sleep quality over time. However, respondents with a higher baseline purpose showed the slowest decline in sleep quality.

### The current study

Based on prior research, we hypothesized that purpose in life would be associated with a reduced incidence of sleep disturbances. We build upon the important work of others and test this hypothesis using a large, nationally representative, and longitudinal sample of adults over the age of 50. We also adjust for a wider range of important factors

that previous research did not adjust for. Building on prior work, we adjusted for potential confounder (e.g., sociodemographic) and pathway (e.g., behavior and biological) variables (Ancoli-Israel, 2009; Foley et al., 2004; Hamilton et al., 2007; Jaussent et al., 2011; Phelan et al., 2010; Ryff et al., 2004; Steptoe et al., 2008).

Past studies suggest that sleep disturbances in older adults are not attributable to age itself, but to increased health and psychological problems that emerge as people age—consequently when health problems are considered and adjusted for in older adult samples, the prevalence of sleep disturbances is low (Ancoli-Israel, 2009; Foley et al., 2004). Therefore, we controlled for a 23-item measure of physical functioning and an index of eight chronic illnesses to examine if the association between purpose and incidence of sleep disturbances would be attenuated. Other studies have found an association between psychological distress and increased risk of sleep disturbances (Ancoli-Israel, 2009; Cho et al., 2008; Taylor et al., 2005; Tsuno et al., 2005; Sivertsen et al., 2012). Therefore, we controlled for anxiety and depression in our analyses to reduce concerns that the association between purpose and sleep disturbances were primarily attributable to the mere absence of psychological distress.

## Methods

### Participants

The Health and Retirement Study (HRS) is a nationally representative panel study of Americans over the age of 50. Since 1992, the study has surveyed over 37,000 people biannually (Sonnega et al., 2014). Starting in the 2006 wave of data collection, the HRS began assessing several psychological factors. Thus, 2006 was the baseline for the present study—baseline psychological and covariate data were assessed during this wave. Incidence of sleep disturbances was assessed during the 2010 follow-up wave. The Institute for Social Research is responsible for the study and provides extensive documentation about the protocol, instrumentation, sampling strategy, and statistical weighting procedures. The study used de-identified, publicly available data. Therefore, the Institutional Review Board at the University of Michigan exempted it from review.

### Procedure

In 2006, a random 50 % of the HRS respondents were selected and visited for an enhanced face-to-face interview. A random half was selected because it was not financially feasible to provide enhanced face-to-face interviews for the entire HRS sample. At the end of the interview, inter-

viewers left behind a self-report psychological questionnaire. Respondents were asked to complete and return the questionnaire by mail to the University of Michigan. Among people who were interviewed, the response rate for the leave-behind questionnaire was 90 %. Only data for respondents over the age of 50 is used when survey weights are applied, because HRS was intentionally created to become a nationally representative sample of adults over the age of 50. Therefore, among those who were interviewed face-to-face, 7168 respondents were eligible for HRS. Only respondents who self-reported minimal or no sleep disturbances at baseline (described further in the *sleep disturbance measurement* section) were kept in the analyses for this study. Therefore 3024 people were excluded from analyses, resulting in a final sample of 4144 respondents.

#### *Purpose in life measurement*

Purpose in life was assessed using a seven-item questionnaire that was adapted from the Psychological Well-Being Scales, a scale with evidence of validity and reliability in a representative sample of adults ( $N = 1108$ ) over the age of 25 (Ryff & Keyes, 1995). The original scale featured 20 items, however, several abbreviated versions of the scale that range from 3 to 14 questions have been developed, psychometrically assessed, and widely used in several studies (Abbott et al., 2006). A slightly altered version of the 7-item scale that was used in this study has been psychometrically evaluated and validated in a previous large-scale study (Abbott et al., 2006).

Respondents rated the degree to which they endorsed each item using a six-point Likert-type scale. Example items include: “I have a sense of direction and purpose in my life” and “My daily activities often seem trivial and unimportant to me.” Negatively worded items were reverse scored and all seven items were averaged to create a scale that ranged from 1 to 6 (all items were summed together, and divided by seven). Higher scores reflected greater levels of purpose (Cronbach  $\alpha = 0.73$ ).

#### *Sleep disturbance measurement*

Using data from the 2006 and 2010 waves of HRS, sleep disturbance symptoms were assessed using a modified version of the four-item Jenkins Sleep Questionnaire, a validated and widely used screening instrument for sleep complaints (Jenkins et al., 1988). This scale does not measure clinically diagnosed sleep problems or disorders, but rather self-reported sleep problems. The scale asked how often do you: “have trouble falling asleep,” “have trouble with waking up during the night,” “have trouble with waking up too early and not being able to fall asleep

again,” and “feel really rested when you wake up in the morning.” Potential responses included: “most of the time,” “sometimes,” and “rarely or never.”

Based on the four items, we created a summary measure. A person was categorized as having a sleep disturbance if they answered “most of the time” to any of the first three questions or either “sometimes” or “rarely or never” to the fourth question (“feel really rested when you wake up in the morning”). The selection for this frequency is based on the chronic insomnia criteria from the 3rd edition of the International Classification of Sleep Disorders, which requires that sleep disturbances and associated daytime symptoms are present at least three times a week (American Academy of Sleep Medicine, 2014). Other studies have used a similar dichotomization and found that more frequent sleep disturbances had stronger associations with medical and physiologic comorbidities (Lallukka et al., 2011a, 2011b, 2011c). Minimal or absence of sleep disturbance was defined as responding “sometimes” or “rarely or never” to any of the first three questions, or answering “most of the time” to the fourth question.

The scale used in this study differs from the original scale in two ways. The items did not ask over what duration of time the symptoms occurred and a three-point Likert scale was used as opposed to the original six-point scale. However, the prevalence rate of sleep disturbances obtained using our measure was similar to the prevalence rates obtained by other studies that have been conducted among older adults (Foley et al., 2004; Jaussent et al., 2011).

#### *Covariates measurement*

Potential confounders or pathways linking purpose with sleep disturbances included sociodemographic, behavioral, health, and psychological factors that prior research suggests are relevant to sleep disturbances. Each covariate described below was collected at baseline in 2006.

Potential confounders included the following sociodemographic factors: age, gender, race/ethnicity (White, Black, Hispanic, Other), marital status (married or not married), educational attainment (no degree, GED or high school diploma, college degree or higher), and total wealth (<25,000; 25,000–124,999; 125,000–299,999; 300,000–649,999; >650,000—based on quintiles of the score distribution in this sample).

Psychological factors that might confound the primary association of interest were assessed with commonly used measures that have been rigorously evaluated and shown both good validity and reliability in previous studies. Anxiety was measured using the Beck Anxiety Inventory (in HRS,  $M = 1.63$ ,  $SD = 0.60$ , Cronbach  $\alpha = 0.80$ ) and

depression was measured using the Center for Epidemiological Studies Depression Scale (CES-D) (in HRS,  $M = 1.71$ ,  $SD = 2.02$ , Cronbach  $\alpha = 0.89$ ). The correlations between purpose and the psychological factors were moderate but significant  $-0.30$  (anxiety) and  $-0.33$  (depression).

Potential behavioral and health pathway factors that might link purpose to sleep disturbances were also considered. Behavioral factors included frequency of moderate (e.g., gardening, dancing, walking at a moderate pace) and vigorous exercise (e.g., running, swimming, aerobics) reported as never, 1–4 times per month, more than once a week), frequency of alcohol consumption (abstinent, <1 or 2 days per month, 1–2 days per week, and more than 3 days per week), and smoking status (never, former, current).

Health factors included an index of major chronic illnesses, a 23-item measure of physical functioning, and self-rated health. For the chronic illness index, self-report of a doctor's diagnosis of eight major medical conditions were recorded at baseline: (1) high blood pressure, (2) diabetes, (3) cancer or malignant tumor of any kind, (4) lung disease, (5) heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems, (6) emotional, nervous, or psychiatric problems, (7) arthritis or rheumatism, and (8) stroke. Respondents reported an average of 2.40 ( $SD = 1.52$ ) conditions. Self-reported health measures used in HRS have been rigorously assessed for their validity and reliability. Physical functioning was conceptualized as a multidimensional construct that assessed general mobility, large-muscle functioning, gross motor skills, fine motor skills, and the ability to execute a variety of activities of daily living and instrumental activities of daily living. Respondents were asked if they experienced difficulty with a series of activities. The items ranged from running or jogging a mile, to shopping for groceries, and bathing (max = 23). The present analyses used a count of reported limitations, where higher values indicated more limitations ( $M = 5.23$ ,  $SD = 4.91$ ). Self-rated health was assessed using a five-category variable that provides a global assessment of well-being. Respondents were asked, "Would you say your health is excellent, very good, good, fair, or poor?" The responses were coded so that higher scores represented better self-rated health.

Baseline sleep disturbance was also included in every model. It was measured as a continuous variable on a 0–8 scale, with higher scores signifying higher sleep disturbance. This measure was created by adding the four sleep items together. Each sleep item ranged from zero to two. For example, for the item that asked "how often do you have trouble falling asleep," people had a score of *zero* if they responded "rarely or never;" a score of *one* if they responded "sometime;" and a score of *two* if they responded "most of the time." However for the last question,

"how often do you feel well rested when you wake up in the morning" the score was reverse coded because the question was worded in the opposite direction compared to the other questions.

### Statistical analyses

We conducted multiple logistic regression analyses to test whether purpose was associated with incidence of sleep disturbances. Logistic regression was used because detailed information on when the sleep disturbances began was not available for each participant. The potential impact of covariates on the association between purpose and sleep disturbances was estimated by adjusting for blocks of covariates.

The first model was minimally adjusted and the second and third models considered the impact of potential confounders. The impact of health behaviors and health pathways was analyzed in a fourth and fifth model. In models 4 and 5, the degree of reduction in the association between purpose and sleep disturbances could be considered as evidence of the degree to which each block of pathway variables serve as mechanisms linking purpose and sleep disturbances.

Model 1 adjusted for age, gender, and baseline level of sleep disturbances. Model 2, the core model, included: age, gender, race/ethnicity, marital status, educational degree, total wealth, and baseline level of sleep disturbances. Three additional models were created; Model 3—core model + psychological distress (anxiety, depression); Model 4—core model + health behaviors (smoking status, exercise, alcohol frequency); and Model 5—core model + health factors (23-item measure of physical functioning, an index of eight chronic illnesses, self-rated health). Although doing so could over fit the model and raise multicollinearity issues, we also created a model 6, which included all covariates. A secondary analysis was performed. We individually tested for potential interactions between gender, age, education, and total wealth with purpose.

In all analyses, logits were converted into odds ratios for ease of interpretation. To account for the complex multi-stage probability survey design (e.g., individual non-response, sample clustering, stratification, and further post-stratification) all results in this study were weighted using HRS sampling weights in Stata (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP).

### Missing data analysis

The overall item non-response rate for all study variables was 1.53 %. However, the missing data were distributed across variables and resulted in a 21.41 % loss of respondents when complete-case analyses were attempted. To

examine the impact of missing data on our results and acquire less biased estimates, a multivariate normal multiple imputation procedure (the “mi estimate” command in Stata) was used to impute missing data. Results were largely the same between the imputed and original datasets. Therefore, we used the dataset with multiple imputation for all analyses reported here because it provides a more accurate estimate of association than other methods of handling missing data (Little & Rubin, 2002).

## Results

### Descriptive statistics

The majority of respondents were female (55 %) and married (59 %). The average age of respondents was 73 years (SD = 10.7). Respondents identified as being White (76 %), Black (15 %), Hispanic (8 %), or “Other” (1 %). Most had a high school degree (53 %) or attended some college (20 %). Table 1 shows all of the descriptive statistics. Among the 4144 respondents who reported minimal or no sleep disturbances at baseline, 1326 people developed sleep disturbances over the 4-year follow-up. On a scale ranging from 1 to 6, the average purpose in life score was 4.32 (SD = 0.97). Purpose in life scores were distributed in the following manner: “1” (0.26 %), “2” (4.10 %), “3” (27.96 %), “4” (35.28 %), “5” (30.70 %), and “6” (6.07 %).

### Purpose and incidence of sleep disturbances

The associations between purpose and incidence of sleep disturbances were highly consistent across all six models (Table 2, Models 1–6). For example, after adjusting for demographic factors (Model 2), each unit increase in purpose (on a six-point purpose in life scale) was associated with a multivariate-adjusted OR of 0.84 for sleep disturbances (95 % CI 0.77–0.92). This suggests that people with higher purpose were at a lower risk for developing sleep disturbances. When each block of potential pathway factors was considered, the associations between purpose and incidence of sleep disturbances were attenuated, but remained significant in all of the models (Table 2, Models 3–6). Finally, potential interactions between gender, age, education, and total wealth with purpose were formally tested and none of the interactions were significant ( $P_s > 0.61$ ).

## Discussion

In a nationally representative sample of U.S. adults over the age of 50 who reported minimal or no significant sleep disturbances at baseline, higher purpose in life was asso-

ciated with a reduced incidence of sleep disturbances over the 4-year follow-up period. After adjusting for sociodemographic factors, each unit increase in purpose (on a six-point purpose in life scale) was associated with a 16 % reduced odds of developing sleep disturbances. The association between purpose and sleep disturbances persisted after adjusting for a range of factors that might confound or explain the association of interest including sociodemographic factors, health behaviors, and baseline health. Adjusting for all of these factors only modestly attenuated the association between purpose and sleep disturbances. Further, an important aspect of this study was that purpose showed an independent association with sleep disturbances, even after adjusting for psychological distress (e.g., anxiety and depression), suggesting that purpose is important for good sleep above and beyond the absence of negative psychological factors.

### Why might purpose in life be associated with incidence of sleep disturbances?

A growing body of research suggests that a strong purpose in life may blunt the negative effects of stress, a factor that negatively influences sleep. Laboratory tests show that people with higher purpose are better at recovering from exposure to negative stimuli. Respondents with higher purpose had a smaller eye blink response after exposure to negative images, an indicator of quicker emotional recovery (Schaefer et al., 2013). When exposed to negative images during functional magnetic resonance imaging, people with stronger purpose in life had lower amygdala activation (a part of the brain that helps process anxiety and fear related processes) than those with a weaker purpose (Van Reekum et al., 2007). A higher purpose may have the ability to blunt stress’ negative impact on the body and mind, resulting in a reduced risk of developing negative psychological conditions such as depression, anxiety, and excessive rumination—factors that have all been linked with sleep disturbances (Ancoli-Israel, 2009; Sivertsen et al., 2012).

At the behavioral level, people with higher purpose generally act in healthier ways. They exercise more (both self-report exercise and objectively measured exercise (e.g., physical activity measured using an accelerometer)), undergo more physical check-ups, partake in better preventive behaviors (e.g., different types of preventive doctor visits such as cancer screenings and cholesterol tests), and acquire adequate relaxation (Holahan et al., 2011; Holahan & Suzuki, 2006; Hooker & Masters, 2014; Kim et al., 2014; Wells & Bush, 2002). All of these studies suggest that people with higher purpose have an overarching tendency to engage in healthier behaviors, behaviors that result in a reduced risk of several health conditions. For

**Table 1** Descriptive statistics

Mean sleep disturbance at baseline (SD)	2.62 (2.11)
Mean age (SD)	72.61 (10.78)
Female	2285 (55.14)
Married status	2457 (59.30)
Race/ethnicity	
White	3143 (75.84)
Black	605 (14.61)
Hispanic	345 (8.33)
Other	51 (1.23)
Education	
<High school	1123 (27.09)
High school	2186 (52.74)
≥College	836 (20.17)
Total wealth	
1st quintile	890 (21.48)
2nd quintile	859 (20.74)
3rd quintile	842 (20.32)
4th quintile	798 (19.25)
5th quintile	755 (18.21)
Smoking status	
Never	1692 (40.84)
Former smoker	1893 (45.67)
Current smoker	559 (13.49)
Exercise	
Never	2951 (71.20)
1–4 times per month	475 (11.46)
More than 1 × per week	719 (17.34)
Alcohol frequency	
Never	2249 (54.28)
<1 per week	692 (16.70)
1–2 per week	593 (14.30)
3 + per week	610 (14.72)
Mean anxiety (SD)	1.63 (0.60)
Mean depression (SD)	1.71 (2.02)
Mean chronic illnesses (SD)	2.40 (1.52)
Mean physical functioning (SD)	5.23 (4.91)
Self-rated health (SD)	2.87 (1.13)

Unless otherwise noted, values are number of participants (percent-age)

example, higher purpose has been linked with a reduced risk of Alzheimer's disease, stroke, heart attack, and a range of other health conditions (Boyle et al., 2010; Kim et al., 2013a, 2013b; Krause, 2009; Roepke et al., 2014) that may lead to sleep complications and disturbances. Another idea that future research should examine is that people with higher purpose in life may have busier days because they engage in a wider array of meaningful activities. Especially among older adults, this may leave less time for napping during the day and increased genuine

tiredness at night, which then may translate into higher quality sleep. The links between purpose and better psychological, neural, behavioral, and physical health suggest that the effects of purpose are expansive, influencing numerous areas of the body and mind that are relevant to health and sleep quality.

### Limitations and strengths

Our study had several limitations. The use of a self-reported sleep disturbance scale likely caused loss in reliability and precision when compared against objective sleep measurements (e.g., polysomnography) that are used to study sleep architecture. However, in the literature, sleep disturbances are not typically evaluated by these objective sleep measures. Rather they are routinely defined as a self-reported condition which includes having difficulties falling asleep or remaining asleep (American Academy of Sleep Medicine; 2014). Results from this study should be further examined using objective measures of sleep disturbance. Further, due to the way in which the questions about sleep disturbance symptoms were asked, we were unable to determine if the sleep disturbance symptoms were chronic or acute. Future research should continue disentangling the complex relationship between sleep disturbances and psychological factors. We hypothesized in our paper that higher purpose predicts lower risk of sleep problems. However, there is likely a reciprocal relationship between purpose and sleep. For example better sleep may cause higher purpose. As demonstrated between depression and sleep disturbances, a reciprocal relationship is highly likely (Sivertsen et al., 2012). Future studies with multi-wave and experimental designs should further examine this issue.

Future research should also examine change in profiles of sleep quality over time. In this dataset, we only had two time points available for analysis and we were unable to perform latent growth mixture models or another type of appropriate analysis to examine trajectories. However with further follow-ups, this dataset will collect additional follow-up sleep quality scores and future researchers should examine this topic. Also, we examined potential pathways between purpose in life and sleep problems by adjusting for blocks of pathway variables. However this is not the most ideal method of examining this question. Future researchers should examine potential mechanisms that help explain the association between purpose in life and sleep using appropriate statistical methods. For example, structural equation modeling could be used so that researchers can decompose effects and simultaneously test multiple mediating pathways.

Despite these limitations, our study had several strengths, which included the use of a nationally repre-

**Table 2** Odds ratios for the association between purpose and sleep disturbance

Model	Covariates	Adjusted logistic regression (95 % CI)
1	Age + gender + baseline sleep disturbance	0.80* (0.74–0.88)
2	Demographic <sup>a</sup>	0.84* (0.77–0.92)
3	Demographic <sup>a</sup> + psychological distress <sup>b</sup>	0.88* (0.80–0.97)
4	Demographic <sup>a</sup> + health behaviors <sup>c</sup>	0.84* (0.77–0.92)
5	Demographic <sup>a</sup> + health <sup>d</sup>	0.87* (0.80–0.96)
6	All covariates <sup>e</sup>	0.90* (0.81–0.99)

\*  $p < .05$

<sup>a</sup> Demographic factors: age, gender, race/ethnicity, marital status, education level, total wealth, baseline levels of sleep disturbance

<sup>b</sup> Psychological distress: anxiety, depression

<sup>c</sup> Health behaviors: smoking, exercise, alcohol use

<sup>d</sup> Health: index of chronic illnesses, physical functioning, self-rated health

<sup>e</sup> All covariates: age, gender, race/ethnicity, marital status, education level, total wealth, anxiety, depression, smoking, exercise, alcohol frequency, index of chronic illnesses, physical functioning

sentative sample of U.S. adults over the age of 50. We were able to examine the association between purpose and sleep disturbances after adjusting for a wide range of pathway and confounder variables. Further, an advanced method of addressing missing data was used. Additionally, a widely used and validated measure of the primary exposure of interest was available. Finally, the prospective nature of our data minimized concerns that the links found in this study were due to reverse causality or retrospective reporting bias.

## Conclusion

An emerging body of research shows that purpose in life is linked with a variety of healthy behaviors, positive health outcomes, longevity and now, incidence of sleep disturbances. Although further research is needed, interventions to enhance purpose in life could be a novel approach for decreasing sleep disturbances.

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**Conflict of interest** Eric S. Kim, Shelley D. Hershner, and Victor J. Strecher declare that they have no conflict of interest.

**Human and animal rights and informed consent** All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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