Purpose in life and use of preventive health care services

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Purpose in life has been linked with better health (mental and physical) and health behaviors, but its link with patterns of health care use are understudied. We hypothesized that people with higher purpose would be more proactive in taking care of their health, as indicated by a higher likelihood of using preventive health care services. We also hypothesized that people with higher purpose would spend fewer nights in the hospital. Participants (n = 7,168) were drawn from the Health and Retirement Study, a nationally representative panel study of American adults over the age of 50, and tracked for 6 y. After adjusting for sociodemographic factors, each unit increase in purpose (on a six-point scale) was associated with a higher likelihood that people would obtain a cholesterol test [odds ratio (OR) = 1.18, 95% confidence interval (CI) = 1.08–1.29] or colonoscopy (OR = 1.06, 95% CI = 0.99–1.14). Furthermore, females were more likely to receive a mammogram/X-ray (OR = 1.27, 95% CI = 1.16–1.39) or pap smear (OR = 1.16, 95% CI = 1.06–1.28), and males were more likely to receive a prostate examination (OR = 1.31, 95% CI = 1.18–1.45). Each unit increase in purpose was also associated with 17% fewer nights spent in the hospital (rate ratio = 0.83, 95% CI = 0.77–0.89). An increasing number of randomized controlled trials show that purpose in life can be raised. Therefore, with additional research, findings from this study may inform the development of new strategies that increase the use of preventive health care services, offset the burden of rising health care costs, and enhance the quality of life among people moving into the ranks of our aging society.

purpose in life | meaning in life | well-being | health screening

Three factors converge to underscore the heightened importance of preventive health care services among United States adults. First, there is the rapidly aging population: by 2050, the number of United States adults over the age of 65 is estimated to double (1). Second, there is the rising cost of medical care: chronic illnesses and end-of-life issues that older adults face are expensive. The Congressional Budget office projects that spending on Medicare will nearly double as a share of gross domestic product (GDP), from 3.7% in 2012 to 7.3% by 2050 (2). Third, despite spending more on health care than any country in the world, United States adults generally have poorer health and lower life expectancies than those in other developed countries (3, 4). This health disadvantage is not solely attributable to those who are poor and underprivileged, because even wealthy, educated Americans are in poorer health than their counterparts in comparable countries (3, 4).

These troublesome realities could be offset by greater use of preventive health care services, which are known to enhance health and reduce health care costs. However, in 2007 the Brookings Institution estimated that only 4% of the $1.7 trillion spent on national health expenditures was for prevention (5). Older adults, in particular, use less preventive health care services than younger and middle-aged adults: they receive fewer cancer screenings, flu shots, mammograms, and pap smears (6). In addition, less than 30% of adults aged 50–64 y and less than 50% of adults over age 65 are up-to-date with core preventive services (7, 8). A central challenge therefore is to identify factors that may increase the likelihood of using preventive health care services. This need is particularly critical in the current climate, given that increased access to preventive care has become available with the Affordable Care Act.

The present study examines a psychological factor—purpose in life—as a potentially important influence on the use of preventive health care services. Conceived as a component of well-being, purpose addresses the extent to which individuals see their lives as having meaning, a sense of direction, and goals to live for (9–12). The concept is often viewed as central to well-being and fulfillment in life (10–15).

A growing body of findings from longitudinal epidemiological studies show that purpose predicts reduced morbidity (e.g., reduced risk of Alzheimer's disease and mild cognitive impairment, as well as reduced risk of stroke and myocardial infarction) and extended longevity (10, 16–21). Further work has linked purpose to better regulation of physiological systems (e.g., reduced inflammatory markers and cardiovascular risk factors) as well as brain-based mechanisms (e.g., insular cortex volume, reduced amygdala activation, sustained ventral striatum activation) (22–30). Additionally, a study that examined gene transcriptional profiles found that eudaimonic well-being (an overarching umbrella term that includes purpose) was associated with enhanced expression of antiviral response genes and reduced expression of proinflammatory genes (31). Furthermore, and perhaps most importantly, purpose—along with other components of psychological well-being—have become the focus of multiple intervention studies designed to improve a person's life outlook (10, 32–35). Therefore, it may provide a point of intervention for improving health outcomes.

Significance

Less than 50% of people over the age of 65 are up-to-date with core preventive services. Identifying modifiable factors linked with preventive services are important targets for research and practice. Purpose in life, recently the focus of multiple intervention studies, has been linked with better health (mental and physical) as well as improved health behaviors. However, its association with health care use has been understudied. We found that higher purpose was linked with greater use of several preventive health care services and also fewer nights spent hospitalized. These results may facilitate the development of new strategies to increase use of preventive health care services and improve health, thereby offsetting the burden of rising health care costs in our aging society.

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The exact mechanisms linking purpose with better health are unclear, but growing research suggests that people with higher purpose are more proactive in taking care of their health. To our knowledge only two studies have examined the association between purpose and preventive health care use, or health care use in general. One study examined 162 members from the Terman Study of the Gifted. Higher purpose was associated with higher profiles of exercise and relaxation, as well as more accident prevention and regular checkups (36). Another study, conducted in 80 women, showed that higher purpose was linked with better preventive behaviors for breast cancer (e.g., screenings and self-examinations) (37). Both studies used cross-sectional designs and had relatively small samples that likely suffer from sampling bias. For example, participants were selected into the first study (the Terman study) because they were intellectually gifted as children, and the participants for the second study were recruited from a local health clinic. Furthermore, neither study adjusted for potential confounders.

We build on this prior work and hypothesize that people with higher purpose are motivated to stay healthy and vital, and therefore are more likely to pursue preventive health care services (e.g., flu shots, cholesterol tests, colonoscopies, mammograms, pap smears, and prostate examinations). As a result of engaging in preventive health care practices, we also hypothesize that people with higher purpose will spend fewer nights in the hospital. Overnight hospital visits are thus used as a proxy for both poorer health and an expensive form of care that imposes a great burden on the health care system. Older adults (65+) account for 34% of hospital stays and 41% of hospital expenditures (38). Each hospital stay for an older adult costs approximately $12,300 (38).

We examine these hypotheses in a nationally representative sample of older United States adults. Our analyses adjust for sociodemographic factors, baseline health, health behaviors, and geographic factors: all factors previously linked with health care use. We further evaluate whether any observed associations between purpose and health care use hold after adjusting for facets of psychological ill-being (depression, anxiety, and negative affect), so as to underscore the unique benefits of purpose in life. Evidence that purpose is associated with health care use even after adjusting for these factors would reduce concerns that associations between purpose and health care use are primarily attributable to the mere absence of psychological ill-being. We also adjust for religiosity and positive affect, two factors that have been linked with health and might confound the relationship between purpose and health care use (39, 40).

Results

Preventive Health Care Services. In models that adjusted for age, race/ethnicity, marital status, education level, total wealth, insurance status, and an index of major chronic illnesses, people with higher purpose in life did not have a higher likelihood of obtaining a preventive flu shot [odds ratio (OR) = 1.04, 95% confidence interval (CI) = 0.97–1.11] (see Table 1 for descriptive statistics and Table 2 to view results from this paragraph). However, each unit increase in purpose (on a six-point purpose-in-life scale) was associated with a higher likelihood that people would obtain a cholesterol test (OR = 1.18, 95% CI = 1.08–1.29) or colonoscopy (OR = 1.06, 95% CI = 0.99–1.14). Furthermore, women with higher purpose were more likely to obtain a mammogram/X-ray (OR = 1.27, 95% CI = 1.16–1.39) or pap smear (OR = 1.16, 95% CI = 1.06–1.28), and men with higher purpose were more likely to obtain a prostate examination (OR = 1.31 95% CI = 1.18–1.45). Minimally adjusted models that only controlled for age showed similar patterns, except the strengths of association were stronger (Table S1).

Table 1. Descriptive statistics

Descriptive variable	No. participants (%)
Mean purpose (SD)	4.52 (0.93)
Mean age (SD) (y)	69.06 (9.84)
Female	4,139 (57.74)
Race/ethnicity	
Caucasian	5,607 (78.22)
African American	936 (13.06)
Hispanic	527 (7.35)
Other	98 (1.37)
Married status	4,639 (64.72)
Education	
<High school	1,366 (19.07)
High school	3,952 (55.14)
≥College	1,850 (25.80)
Total wealth	
First quintile	1,437 (20.05)
Second quintile	1,431 (19.96)
Third quintile	1,436 (20.03)
Fourth quintile	1,431 (19.96)
Fifth quintile	1,433 (19.99)
Mean no. of chronic illnesses (SD)	2.11 (1.43)
Smoking status	
Never	3,116 (43.47)
Former smoker	3,145 (43.88)
Current smoker	907 (12.65)
Exercise	
Never	4,528 (63.17)
One to four times per month	1,008 (14.05)
More than once per week	1,632 (22.77)
Alcohol frequency (d/wk)	
Never	3,486 (48.63)
<1	1,300 (18.14)
1–2	1,134 (15.82)
3+	1,248 (17.40)
Insured	6,850 (95.58)
Urbanicity	
Urban	3,332 (46.49)
Suburban	1,535 (21.41)
Rural	2,301 (32.10)

Unless otherwise noted, values are number of participants (percentage).

Purpose and Number of Nights Spent in the Hospital. The average number nights spent in the hospital over the 6-y follow-up was 7.21 (SD = 13.87). In the core model that adjusted for sociodemographic factors, each unit increase in purpose was associated with a 17% reduction in the number of reported nights spent in the hospital over the 6-y follow-up [rate ratio (RR) = 0.83, 95% CI = 0.77–0.89] (Table 3, model 1). The association between purpose and number of nights spent in the hospital were attenuated but remained in all of the subsequent covariate models (Table 3, models 2–5).

Considering Other Psychological Factors. When negative psychological factors (depression, anxiety, negative affect) were sequentially added to the base model, they only modestly decreased the association between purpose and health care use (e.g., number of nights spent in the hospital and preventive health care use; data now shown). For example, when anxiety was added to the core model, which examined the association between purpose and number of nights spent in the hospital, the multivariate-adjusted RR for purpose was 0.87 (95% CI, 0.81–0.93). Similarly, when religiosity or positive affect were separately added to the base model, they only modestly decreased the association between purpose and health care use (e.g., number of

Table 2. Odds ratios for the association between purpose and preventive health care services

Health service measure	Adjusted OR (95% CI)	*P* value	Prevalence (%)
Preventive flu shot*	1.04 (0.97–1.11)	0.255	64.03
Cholesterol test†	1.18 (1.08–1.29)	<0.001	76.52
Colonoscopy‡	1.06 (0.99–1.14)	0.076	27.24
Mammogram/X-ray§	1.27 (1.16–1.39)	<0.001	59.59
Pap smear§	1.16 (1.06–1.28)	0.001	33.44
Prostate examination¶	1.31 (1.18–1.45)	<0.001	57.61

All models controlled for the following covariates: age, race/ethnicity, marital status, education level, total wealth, insurance status, index of major chronic illnesses.
*n = 7,168.
†Only people with no history of heart disease or stroke (n = 5,160).
‡Only people with no history of cancer (n = 6,070).
§Only women with no history of cancer (n = 3,535).
¶Only men with no history of cancer (n = 2,534).

nights spent in the hospital and preventive health care use; data now shown). Overall, the associations between purpose and health care use remained even after adjusting for these psychological factors. The benefits of purpose in life for preventive health practice may also extend to other dimensions of psychological well-being (*Supporting Information*).

Additional Analyses. When examining tertiles of purpose, the findings suggested a dose–response relationship between purpose and preventive health care use (Table S2). Increasing purpose was associated with a higher likelihood of preventive health care use. For example, relative to women with the lowest purpose, women with moderate purpose were more likely to acquire a mammogram/X-ray (OR = 1.32, 95% CI = 1.09–1.60) (Table S2), whereas women with the highest purpose were the most likely to acquire a mammogram/X-ray (OR = 1.57, 95% CI = 1.29–1.92). For some preventive health care services (e.g., colonoscopies and pap smears), the high-purpose group was associated with preventive health care services but the moderate-purpose group was not. However, a dose–response trend was still evident in all of the analyses that examined preventive health care services.

When examining tertiles of purpose, a dose–response relationship also existed between purpose and number of nights spent in the hospital. For example, in the core model (Table S3, model 1) relative to those with the lowest purpose, people with moderate purpose had a somewhat reduced number of nights spent in the hospital (RR = 0.77, 95% CI, 0.66–0.89), whereas those with the highest purpose spent the least number of nights in the hospital (RR = 0.67, 95% CI, 0.56–0.79).

Discussion

In a nationally representative sample of United States adults over the age of 50, higher purpose in life at baseline was prospectively associated with a higher likelihood of preventive health care service use. Although higher purpose was not associated with a higher likelihood of obtaining a preventive flu shot, adults with greater purpose were more likely to obtain a cholesterol test or colonoscopy. In addition, women with higher purpose were more likely to obtain a mammogram or pap smear, and men with higher purpose were more likely to obtain a prostate examination. Furthermore, after adjusting for sociodemographic factors each unit increase in purpose was associated with a 17% decrease in the number of nights spent in the hospital.

Past research has shown that negative psychological factors are associated with less preventive health care service use but higher overall health care use (41, 42). However, the present results showed that higher purpose in life was associated with greater use of preventive health care services and fewer overnight hospitalizations above and beyond the effects attributable to depression, anxiety, and negative affect. This outcome underscores the important point that psychological strengths, such as having meaning and direction in one's life, involves more than being free from emotional distress. Furthermore, the association between purpose and health care use lasted (or remained marginally significant) after adjusting for a range of other covariates, including sociodemographic factors, baseline health, health behaviors, geographic factors, religiosity, and positive affect.

The findings from this study may help explain the growing body of research that has linked higher purpose with positive physical, biological, and neural health. Physically, higher purpose has been linked with a wide range of positive health outcomes. For example, people with higher purpose not only live longer, but they also have a reduced risk of debilitating conditions, such as stroke, myocardial infarction, loss of physical functioning, and Alzheimer's disease (10, 16–21, 43). Biologically, higher purpose has been linked with a healthier profile of biomarkers, including lower levels of salivary cortisol, lower levels of soluble IL-6r (an important inflammatory factor), a lower waist–hip ratio, higher levels of HDL ("good" cholesterol), and healthier telomerase activity (22–25, 44). Furthermore, purpose may impact health through the immune system. In bereaved women who were participating in a distress-alleviating intervention, women showing greater increases in purpose also showed the greatest increases in natural killer cell activity (23). Neurally, researchers used functional MRI to examine how people's amygdala activation differed in response to negative versus neutral stimuli. People with higher purpose displayed increased ventral anterior cingulated cortex activation and reduced amygdala activation (26). Another study used structural MRI and found that purpose was positively associated with right insular cortex gray matter and negatively associated with middle temporal gyrus gray matter (27). Additionally, functional MRI scans from another study revealed that when people were shown positive stimuli, people with higher eudaimonic well-being (an overarching umbrella term that includes purpose) displayed sustained ventral striatum and dorsolateral prefrontal cortex activity (28).

The links between higher purpose and enhanced physical, biological, and neural health suggest that the benefits of purpose are broad, impacting several areas of the body and mind that are relevant to health [see Ryff (10) and Roepke, et al. (20) for recent reviews on this topic]. However, few studies have examined the mechanisms that might explain the links described above. This study suggests that the proactive preventive health care behaviors that people with higher purpose perform result in positive health outcomes. Future research should further

Table 3. Rate ratios for the association between purpose and number of nights spent in the hospital

Model	Covariates	Adjusted RR (95% CI)	*P* value
1	Core sociodemographic factors*	0.83 (0.77–0.89)	<0.001
2	Demographic* + baseline health†	0.89 (0.83–0.95)	0.002
3	Demographic* + health behaviors‡	0.87 (0.81–0.93)	<0.001
4	Demographic* + geographic§	0.83 (0.78–0.89)	<0.001
5	All covariates¶	0.92 (0.86–0.99)	0.021

*Core sociodemographic factors: age, sex, race/ethnicity, marital status, education level, total wealth, insurance status.
†Baseline health: index of major chronic illnesses.
‡Health behaviors: smoking, exercise, alcohol use.
§Geographic: region, urbancity.
¶All covariates: age, sex, race/ethnicity, marital status, education level, total wealth, insurance status, index of major chronic illnesses, smoking, exercise, alcohol use, region, urbancity.

examine if preventive health care behaviors are indeed a mechanism by which purpose enhances health.

Viktor Frankl is one of the first modern day scientists to write extensively about purpose in life. Based on his profound experiences in Nazi concentration camps, Frankl created several theories on why a greater purpose in life might help people live longer. In one theory, he hypothesized that people with higher purpose are able to live longer because they have a greater will to live (12). Echoing a sentiment spoken by Nietzsche, Frankl said, "Those who have a 'why' to live, can bear with almost any 'how.'" In the context of this study, people with higher purpose may act in healthier ways and take more preventive steps because they have a greater will to live, which gives them more incentive to take preventive measures that may seem time consuming, costly, fear-inducing (e.g., a parent had cancer so a person may be afraid of cancer-screening results), or even painful. Past research examining the links between purpose and behavioral outcomes converge with findings from this study. People with higher purpose are more likely to get exercise and relax as well as to acquire more regular checkups (36, 37, 45). All of these activities may be prompted by an overarching outlook in which life itself is greatly valued. This study had many limitations and strengths. The present findings rely on self-reported health care use, which may be open to bias. However, the validity of self-reported health care use has been replicated in a range of samples, where self-reported health care use shows high agreement with medical records and administrative claims (46–48). Furthermore, the Health and Retirement Study (HRS) preventive measures were evaluated by benchmarking them against other national surveys and shown to have high reliability and validity (49). Even so, future studies should examine the association between purpose and health care use using medical records or administrative claims. It is also unclear why purpose was not associated with more flu shots, even though it was associated with five other preventive behaviors (cholesterol tests, colonoscopies, mammograms/X-rays, pap smears, and prostate examinations). One possible explanation is related to question wording (i.e., getting a flu shot from one's doctor), given that many people get free flu shots at work, local community centers, or religious centers. Furthermore, this study did not assess illness behavior or related constructs. Illness behavior helps explain the different ways in which people perceive, evaluate, and respond to symptoms (50). Future studies should examine how illness behavior impacts the association between purpose and health care use.

Despite these limitations, this study was conducted in a large, nationally representative sample of United States adults over the age of 50. The prospective nature of the data minimized concerns that obtained associations were because of retrospective reporting bias or reverse causality. We were also able to assess the association between purpose and health care use after adjusting for a wide array of covariates. Furthermore, a widely used and validated measure of purpose was used.

Several promising interventions have shown that purpose, along with other facets of psychological well-being, can be improved for greater segments of the population (10, 51). Furthermore, growing evidence suggests that interventions (that are overtly designed to enhance well-being) can improve behavioral and biological outcomes in lasting ways (51). Ryff (10) reviewed over a dozen psychiatric intervention studies that have used various techniques (e.g., cognitive behavioral therapy, meditation, emotional disclosure) to enhance facets of psychological well-being. An example of a promising intervention is a type of cognitive behavioral approach called Well-Being Therapy. The technique has been shown to effectively help people suffering from a wide range of psychological disorders to achieve optimal levels of psychological well-being (34, 35). The technique is typically used after standard care (e.g., cognitive behavioral therapy and pharmacotherapy) and is known to help prevent relapse. Additionally, early randomized controlled trials have shown that a meaning-centered therapy, delivered either in a group or individual format, can help raise meaning and purpose in life among people with cancer (32, 33). Finally, as people retire, several volunteering programs have emerged that help older adults transition into meaningful and socially engaging activities, likely enhancing their sense of purpose in life (e.g., Experience Corp, Retired and Senior Volunteer Program, Foster Grandparents) (52). Future studies should systematically examine how these programs impact levels of purpose among its volunteers.

The practical implication of the present findings are that people with higher purpose use more preventive health care services and impose less of a burden on the health care system. In 2011, people made ~38.6 million hospital stays in the United States; the aggregated cost of these stays was $387 billion (53). Considering our rapidly aging population, which will likely use increasing amounts of health care, the difference in health care costs incurred by people with the most versus least purpose might be substantial. Building on needed replication of the present findings, intervention studies designed to improve experiences of purpose in life may be warranted. Doing so could offer new avenues for increased use of preventive health care use, thereby decreasing health care costs and enhancing quality of life among those moving into the ranks of our aging society.

Methods

Study Design and Sample. The HRS is an ongoing nationally representative panel study of United States adults aged 50 and older. The study has interviewed respondents every 2 y since 1992, and new cohorts are added to keep the study sample representative (54). Over the course of the study it has interviewed over 37,000 people. The HRS is sponsored by the National Institute on Aging and is conducted by the University of Michigan (54). Starting in 2006, a random 50% of HRS respondents were assigned to undergo an enhanced face-to-face interview. A random 50% were 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, respondents were given a self-report psychosocial questionnaire, which they completed and returned by mail to the University of Michigan. Among people who were interviewed, the response rate for the leave-behind questionnaire was 90% and the final sample consisted of 7,168 respondents. The HRS website provides extensive documentation about the protocol, instrumentation, and complex sampling strategy (http://hrsonline.isr.umich.edu). Because the present study used de-identified, publicly available data, the Institutional Review Board at the University of Michigan exempted it from review.

Purpose in Life Measurement. Purpose in life was assessed using a seven-item questionnaire adapted from the Psychological Well-Being Scales, a measure with evidence of reliability and validity in a nationally representative sample of adults (n = 1,108) over the age of 25 (55). Although the original scale includes 20 items, several shortened versions of the scale, ranging from 3 to 14 questions, have been developed and psychometrically assessed (56). A slightly altered version of the seven-item scale that was used in this study has been psychometrically evaluated and validated in a previous large-scale study (56).

On a six-point Likert scale, respondents rated the degree to which they endorsed items, such as, "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. The seven items were averaged (all items were summed together, then divided by seven) to create a scale that ranged from 1 to 6. Higher scores reflected greater levels of purpose (Cronbach $\alpha = 0.73$). In addition, we created tertiles of purpose to examine the possibility of threshold or discontinuous effects. The mean purpose scores by tertile were: 3.54 (low), 4.64 (moderate), and 5.56 (high).

Preventive Health Care Service Measurement. To identify visits that were made in the service of primary prevention, the number of respondents in our analyses changed depending on which preventive service was examined. For example, analyses for the prostate examination used only data from men with no history of cancer. Sensitivity analyses comparing models with and without adjustment for the relevant disease (e.g., including and excluding

men with a history of cancer in the prostate examination analyses) indicated little difference in the estimated effects.

The outcome variables were measured in 2012. Each respondent was asked sex-specific questions regarding use (yes/no) of preventive health care services over the last 2 y (2010–2012). In total, HRS asked about six preventive measures recommended by either the United States Preventive Services Task Force or the Centers for Disease Control and Prevention. Respondents were asked: In the last 2 y, have you had any of the following medical tests or procedures: A flu shot? A blood test for cholesterol? A colonoscopy, sigmoidoscopy, or other screening for colon cancer? A mammogram or X-ray of the breast to search for cancer? A pap smear? An examination of your prostrate to screen for cancer? The HRS preventive measures were evaluated by benchmarking them against other national surveys and have shown high reliability and validity (57).

Overnight Hospital Visit Measurement. The number of nights spent in the hospital was assessed using data from the 2008, 2010, and 2012 waves. During those waves, respondents were asked: "Have you been a patient in a hospital overnight?" If the respondent answered "no," the respondent was assigned a value of zero. If the respondent answered "yes," the respondent was then asked, "How many nights were you a patient in the hospital?" Overnight hospitalization reports from the 2008, 2010, and 2012 waves were summed to cover a 6-y period from 2006 to 2012. Studies have also demonstrated that self-reported health care use shows substantial agreement with both medical records and administrative claims (46–48).

Baseline Covariates. All baseline covariates were assessed in 2006. Sociodemographic factors included: age, sex, race/ethnicity (Caucasian, African-American, Hispanic, Other), marital status (married/not married), educational attainment (no degree, GED or high school diploma, college degree or higher), 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), and health insurance status (yes/no).

Baseline health factors included an index of eight major chronic illnesses. For the chronic illness index, self-report of a doctor's diagnosis concerning eight major medical conditions was recorded at baseline: (*i*) high blood pressure; (*ii*) diabetes; (*iii*) cancer or malignant tumor of any kind (excluding minor skin cancer); (*iv*) lung disease; (*v*) heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; (*vi*) emotional, nervous, or psychiatric problems; (*vii*) arthritis or rheumatism; and (*viii*) stroke. Self-reported health measures used in HRS have been rigorously assessed for their validity and reliability (49, 54).

Health behaviors included smoking status (never, former, current), frequency of exercise (never, one to four times per month, more than once a week), and frequency of alcohol consumption (abstinent, less than 1 or 2 d per month, 1–2 d per week, and more than 3 d per week).

Geographic factors included urbanicity (urban, suburban, and rural) and region. To protect the identity of respondents, HRS automatically categorizes respondents into nine broad regions.

Statistical Analyses. Logistic regression was used in the analyses that examined preventive health care service use. For this set of analyses, all results can be interpreted as the change in odds of obtaining a preventive service as a function of a one unit increase in purpose in life (a six-point scale). For the analyses that examined overnight hospital visits, we used a generalized linear model with a negative binomial distribution and log-link rather than an ordinary least-squares regression. This statistical method appropriately models count data that has overdispersion and a skewed distribution. Because of the nonlinear nature of the model, the estimated β-coefficients were not directly interpretable. Therefore, to obtain more easily interpretable results, the coefficients created by the model were exponentiated into RR estimates using the eform command in Stata. We used HRS sampling weights in this study to account for the complex multistage probability survey design.

For analyses that examined the association between purpose and overnight hospitalizations, we examined the impact of the risk factors by creating a core model (model 1) and then considered the impact of related covariates in turn. A total of five models were created. Model 1, the core model, adjusted for age, sex, race/ethnicity, marital status, education level, total wealth, and insurance status; model 2 includes core model + baseline health (index of eight major chronic illnesses); model 3 includes core model + health behaviors (smoking, exercise, and alcohol use); and model 4 includes core model + geographic factors (region and urbanicity). Although doing so could raise multicollinearity issues, we also created a model 5, which included all covariates.

In analyses that examined the association between purpose and preventive health care services, we used a simpler model for two reasons. First, we included only factors that had been repeatedly identified in the literature as potential confounders and second, presenting five covariate models for each of the six preventive health care services became unwieldy. Thus, in preventive health care service analyses we controlled for factors that were from the core sociodemographic model, which included: age, race/ethnicity, marital status, education level, total wealth, insurance status, and an index of eight major chronic illnesses.

Three additional analyses were performed. First, we examined if associations found between purpose and health care use (e.g., preventive health care use and number of nights spent in the hospital) were maintained after controlling for depression, anxiety, and negative affect. Using the core model, we added each psychological factor one at a time. Second, we examined if associations between purpose and health care use remained after controlling for positive affect or religiosity. Third, we examined the data for a potential threshold effect by considering tertiles of purpose.

Missing Data. For all study variables, the overall item nonresponse rate was 6.36%. However, there were missing data across many variables. Thus, a complete case analysis (i.e., using data only from respondents with complete data on all variables) resulted in a 7.73–42.44% loss of respondents, depending on which analysis was run (e.g., analyses examining pap smears only had a 7.73% loss of respondents when analyses were run only on respondents with no missing data, whereas analyses examining cholesterol tests had 42.44% loss of respondents). Therefore, to obtain less-biased estimates, multiple imputation procedures were used to impute missing data. Sensitivity analyses showed that the results were maintained before and after the implementation of multiple imputations. We therefore used the dataset with multiple imputation for all analyses reported here, because so doing provides a more accurate estimate of association than other methods of handling missing data (58).

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