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Positive Self-Perceptions of Aging and Lower Rate of Overnight Hospitalization in the US Population Over Age 50

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Abstract

Objective—The aging of the Baby Boomer generation has led to an unprecedented rise in the number of U.S. adults reaching old age, prompting an urgent call for innovative and cost-effective ways to address the increasing health care needs of the aging population. Studying the role of psychosocial factors on health care utilization could offer insight into how to minimize hospitalizations among older adults.

Methods—We use prospective data from a subsample of 4,735 participants (mean age (*SD*) = 69 (8.79) years; 61% women) from the Health and Retirement Study, a nationally representative study of U.S. adults over age 50, to examine the association between self-perceptions of aging and self-reported overnight hospitalizations after adjusting for a comprehensive list of sociodemographic, health-related, and behavioral factors.

Results—Over the four-year follow-up, there were a total of 5,196 overnight hospitalizations, and 44% of the sample reported being hospitalized overnight at least once. After adjusting for sociodemographic factors, each standard deviation increase in positive self-perceptions of aging was associated with a lower rate of overnight hospitalization (IRR, 0.75 [95% CI, 0.71–0.80]; $p < .001$). After dividing respondents into quartiles of self-perceptions of aging, we observed a dose-response relationship with individuals in higher quartiles showing increasingly lower rates of overnight hospitalization.

Conclusions—Positive self-perceptions of aging are associated with a lower rate of hospitalization among older adults over 4 years. Future research should examine the factors that contribute to older adults' self-perceptions of aging and explore the pathways through which attitudes towards aging influence the use of health care resources.

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Keywords

aging; self-perceptions of aging; hospitalization; health care utilization; prospective studies; Health and Retirement Study

INTRODUCTION

Successful aging has become a topic of great public and research interest. With the aging of the Baby Boomer generation and rising health care costs among the population over 50, focus has been directed towards helping older adults maintain high levels of cognitive, physical, and social functioning despite age-related declines (1). Although there is no consensus on what it means to age successfully, a growing body of literature suggests that the subjective evaluation of the aging process may be more important than the objective presence or absence of disease/disability in determining health and well-being in old age (2). Therefore, one construct of particular importance when studying the health and well-being of older adults is self-perceptions of aging (SPA), or attitudes towards one's own aging experience. Positive self-perceptions of aging have been associated with a variety of health outcomes among older adults including increased longevity (3,4), better functional health (5), higher likelihood of recovery from severe disability (6), and enhanced physical recovery following an acute myocardial infarction (7).

What determines an individual's self-perceptions of aging? According to Levy's stereotype embodiment theory (8), individuals are exposed to age stereotypes across the lifespan, and the internalization of these stereotypes shapes individuals' evaluations of their own aging experience. As individuals progress through the life course, they receive both implicit and explicit messages about the process of aging. Over time, the content of these messages consolidates as stereotypes, and individuals acquire stereotypic expectations about older adults and what it means to grow old. Upon reaching old age, age stereotypes gain salience, and older adults may incorporate attributes of the "typical old person" into their own self-concept, resulting in the embodiment of these characteristics in their everyday behaviors. Experimental studies indicate that both positive and negative age stereotypes can operate on an unconscious level. When older adults are primed with age-stereotypic words, they exhibit significant changes in memory (9), locomotion (10), hearing (11), and handwriting (12), suggesting that they may be unaware of the effects of age stereotypes on their behavior in real-life situations. Consequently, the extent to which older adults integrate positive or negative stereotypical information into their own self-views determines their self-perceptions of aging.

When age stereotypes are incorporated into the self-concept and used by older adults to evaluate their own aging experience, they have the potential to influence health at multiple levels. While many studies have explored how exposure to age stereotypes can lead to short-term changes in biology, beliefs, and behaviors, we hypothesize that self-perceptions of aging can also influence longer-term, downstream health care utilization outcomes, such as the risk of hospitalization. At the physiological level, older adults subliminally primed with negative aging stereotypes experience a heightened cardiovascular response after completing

a mathematical or verbal challenge (13). Over the long-term, frequent and sustained activation of the hypothalamic-pituitary-adrenal (HPA) axis and/or sympathetic nervous system in response to stressful situations (e.g., threat from age stereotypes) could lead to conditions that increase the risk for hospitalization (14). Indeed, several recent meta-analyses have shown a longitudinal association between greater stress reactivity and/or impaired stress recovery and poor cardiovascular outcomes (15,16).

At the psychological level, numerous studies have shown that age stereotypes may turn expectations regarding aging into self-fulfilling prophecies. Levy & Leifheit-Limson (10) observed a “stereotype-matching effect” in which age stereotype primes had the largest impact when the content of the stereotype (e.g., cognitive vs. physical) matched the experimental task (e.g., photo recall vs. timed chair stand). Over time, the embodiment of age stereotypes may trigger changes in actual behavior and contribute to reduced strength, poor physical functioning and low muscle density – all of which have been shown to increase the risk for hospitalization (17). At the behavioral level, recent studies have shown that individuals with more positive SPA are more likely to engage in preventive health behaviors (18). Accordingly, older adults who abstain from smoking (19), exercise more frequently (20), and/or adhere to medication regimens (21) have a lower risk of hospitalization.

The present study examines the association between self-perceptions of aging and all-cause hospitalization by extending a previous study that investigated the relationship between SPA and adverse events among a sample of 1,422 older adults aged 65–70 from Lausanne, Switzerland (22). Using logistic regression, Moser and colleagues found an association between SPA and risk of hospitalization but not beyond the first year of follow-up. In the current study, we reexamine the association between SPA and hospitalization by 1) using a larger, nationally representative sample of older U.S. adults with a wide age range (53–96 years), 2) using negative binomial regression to capture the association between SPA and the *rate* of overnight hospitalization, and 3) adding additional covariates to the models including race/ethnicity, health insurance status, ADL limitations, and health behaviors—all potential confounding or pathway variables (5,18,23,24). We hypothesize that more positive SPA will be associated with a lower rate of overnight hospitalization over a four-year follow-up, even after controlling for sociodemographics, baseline health, and health behaviors.

METHODS

Study Population

The Health and Retirement Study (HRS) is a nationally representative biennial panel study of U.S. adults over the age of 50 that is supported by the National Institute on Aging (U01AG009740) and conducted by the Survey Research Center at the University of Michigan’s Institute for Social Research (<http://hrsonline.isr.umich.edu/>). HRS interviews participants every two years and follows them from the time they enter the study until their death. The study website provides extensive documentation on the protocol, instrumentation, sampling strategy, and statistical weighting procedures.

Starting in 2008, HRS has included a measure of self-perceptions of aging in a self-administered Psychosocial and Lifestyle Leave-Behind Questionnaire given to participants who complete an enhanced face-to-face interview (EFTF). In a rotating design, a random 50% of the HRS longitudinal panel is assigned each wave for an EFTF interview to collect physical measures, biomarkers, and psychosocial data (25). The remaining 50% of the panel are interviewed by telephone. Among people in 2008 who completed the EFTF interview, the response rate for the Psychosocial and Lifestyle Leave-Behind Questionnaire was 89% (26). The HRS protocols are approved by the University of Michigan Health Services Institutional Review Board. The present study was exempted from review because it uses de-identified and publicly available data.

The study sample consisted of 4,735 participants who 1) completed the Psychosocial and Lifestyle Questionnaire by mail or telephone in 2008, 2) survived the 4-year follow-up period, 3) completed the Health Services and Insurance section of the core interview in 2006, 2008, 2010, and 2012, and 4) had no missing data on any of the variables included in the models. Figure 1 provides a complete description of the inclusion criteria for the analytic sample. Given the complex sample survey design, appropriate methods for computing point and variance estimates for a subpopulation were applied (27).

Self-Perceptions of Aging

Self-perceptions of aging were measured in 2008 using an 8-item scale that included five items from the Attitude Toward Own Aging subscale of the Philadelphia Geriatric Center Morale Scale (28,29) and an additional three items from the Berlin Aging Study (30). On a scale from 1 (strongly disagree) to 6 (strongly agree), respondents indicated the degree to which they endorsed statements such as “Things keep getting worse as I get older,” “The older I get, the more useless I feel,” and “So far, I am satisfied with the way I am aging.” (See Table S1, Supplemental Digital Content 1, for a list of all eight items in the HRS self-perceptions of aging scale). Negatively worded items were reverse coded, and all items were averaged so that higher scores corresponded to more positive self-perceptions of aging. The final score was set to missing if there were more than four items with missing values. Cronbach’s alpha for the overall scale was 0.82. Scores were standardized ($\mu=0$, $\sigma=1$) to facilitate interpretation and comparison of effect size among other studies of self-perceptions of aging. As a follow-up analysis, SPA scores were divided into quartiles based on the distribution in the sample in order to detect discontinuous or threshold effects.

Overnight Hospitalization

The number of overnight hospitalizations was assessed in 2010 and 2012 to cover a four-year follow-up period. In each core interview, respondents were asked: “In the last two years, have you been a patient in the hospital overnight?” Respondents who had not been hospitalized were assigned a score of zero, while respondents who had been hospitalized were then asked: “How many different times were you a patient in a hospital overnight?” The number of hospitalizations reported in 2010 and 2012 were summed to determine the total number of hospitalizations from 2008–2012. The number of hospitalizations in the four years prior to baseline (2004–2008) was calculated the same way using data from 2006 and

2008. Studies have shown high concordance between self-reported and Medicare claims-based hospital episodes (31).

Covariates Measurement

Baseline (2008) variables were included in the models based on *a priori* knowledge of their influence on the rate of overnight hospitalization in the study population. Sociodemographic variables included age, sex, race/ethnicity (White/Caucasian, Black/African American, Hispanic, Other), educational attainment (no degree, GED or high school diploma, college degree or higher), living arrangement (living alone vs. living with others), total household wealth (quintiles based on the distribution in the sample), and health insurance status (insured vs. uninsured). To control for baseline health, we included 1) an index of eight depressive symptoms (felt depressed, everything an effort, sleep was restless, was happy (reversed), felt lonely, felt sad, could not get going, enjoyed life (reversed)), 2) an index of eight chronic conditions (high blood pressure; diabetes; cancer or malignant tumor of any kind; lung disease; heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; emotional, nervous, or psychiatric problems; arthritis or rheumatism; stroke) (32), 3) the number of activities of daily living (ADLs) performed with difficulty (bathing, dressing, eating, getting in/out of bed, walking across a room) (33,34), and 4) the number of hospitalizations in the previous four years (2004–2008). Health behavior variables included alcohol consumption frequency (abstinent, <1 day per week, 1 to 2 days per week, more than 3 days per week), smoking status (never, former, current), and frequency of moderate (e.g., gardening, dancing, walking at a moderate pace) and/or vigorous exercise (e.g., running, swimming, aerobics) (never, 1–4 times per month, more than once a week).

Data Analysis

Data were analyzed using negative binomial regression, an appropriate method for modeling count data with a skewed distribution and overdispersion. 56% reported no hospital stays over the four-year follow-up period. For ease of interpretation, coefficients were converted into incidence rate ratios (IRRs) using the `irr` command in Stata (35). All analyses were design-based, using the `svy` commands in Stata to account for the complex sampling features of HRS when computing weighted estimates and linearized standard errors (36).

We started with an unadjusted model (Model 1) and then created a minimally adjusted model (Model 2: age and sex) to examine the association between SPA and overnight hospitalization. Next, we generated the core model (Model 3), which included age, sex, and additional sociodemographic variables (race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status). Model 4 (core + baseline health: depressive symptoms, chronic diseases, ADL limitations, previous hospitalizations) and Model 5 (core + health behaviors: alcohol consumption, smoking status, exercise frequency) were designed to explore the degree to which each additional block of variables may mediate the link between SPA and rate of overnight hospitalization. Finally, Model 6 included all covariates, even though the large number of variables could potentially overfit the model and lead to issues with multicollinearity.

As a sensitivity analysis, we assessed whether the association between SPA and overnight hospitalization persisted evenly over the four-year period by examining the association between SPA and hospitalization rate in the first two years versus the last two years of follow-up. Furthermore, by examining the association between SPA and hospitalization after excluding hospitalizations occurring within two years of baseline, we tested the possibility that respondents in the poorest health were driving the association between SPA and hospitalization. In other words, we addressed the possibility of reverse causality by removing individuals who may have been in danger of imminent hospitalization at the time of SPA measurement and therefore, rated their SPA more poorly. We also divided SPA into quartiles in order to detect any discontinuous or threshold effects. Finally, we tested for interaction effects between sex and SPA on the outcome measure.

RESULTS

Descriptive Analyses

The average age at baseline was 69.03 years. Most respondents were female (61%) and had completed high school (55%) or at least some college (27%). 77% of respondents self-identified as White/Caucasian, 12% as Black/African American, 9% as Hispanic, and 2% as Other. The majority of respondents lived with others (76%) and had some type of health insurance (96%). Over the four-year follow-up, there were a total of 5,196 overnight hospitalizations, and 44% of respondents reported being hospitalized overnight at least once. The number of hospitalizations ranged from 0 to 76, with a mean of 1.10, a median of 0, and an interquartile range of 1 over four years. Self-perceptions of aging were negatively correlated with age ($r = -0.12$). In an adjusted regression analysis controlling for sociodemographic and health-related factors, participants were likely to have more positive self-perceptions of aging if they were younger, were female, self-identified as Black/African American, were wealthier, had fewer chronic conditions, had fewer depressive symptoms, and/or had fewer ADL limitations. Table 1 reports respondent characteristics by SPA quartile. The mean SPA scores by quartile were 2.65 (low), 3.68 (low-moderate), 4.36 (moderate-high), and 5.27 (high), with corresponding z-scores of -1.26 , -0.26 , 0.40 , and 1.28 .

Self-Perceptions of Aging and Rate of Overnight Hospitalization

After adjusting for sociodemographic factors (Model 3), each standard deviation (SD) increase in SPA was associated with a lower rate of hospitalization (IRR, 0.75 [95% CI, 0.71–0.80]; $p < .001$). While the effect size was somewhat diminished with each block of covariates, the association between SPA and the overnight hospitalization remained significant across all models (Table 2). See additional details in Table S2, Supplemental Digital Content 2, which shows negative binomial regression models of SPA and adjusted incidence rate ratios for overnight hospitalization with all covariates.

Next, we examined the association between SPA and the rate of hospitalization in the first two years versus the last two years of follow-up. Unlike Moser and colleagues (22), we found a consistent association between SPA and the rate of overnight hospitalizations over all four years. After excluding hospitalizations that occurred in the first two years of follow-

up, there continued to be a significant relationship between SPA and hospitalizations that occurred in years 3 and 4, supporting the proposed direction of findings. While it is possible that the risk of imminent hospitalization is affecting older adults' evaluation of their aging experience, the presence of a significant association between SPA and hospitalization even after adjusting for baseline health and excluding near-term hospitalizations supports the claim that the effect of SPA on health is stronger than the reverse (23,24). In the sociodemographic model (Model 3), each SD increase in SPA was associated with similar decreases in the rate of hospitalization over the first two years (IRR, 0.75 [95% CI, 0.70–0.81]; $p < .001$) and the second two years (IRR, 0.76 [95% CI, 0.71–0.81]; $p < .001$) (Table 3). The analyses by SPA quartiles suggested a dose-response relationship. Compared to those with the lowest level of SPA, those with low-moderate, moderate-high, and high SPA had a 33%, 36%, and 55% lower rate of hospitalization, respectively (Model 3, Table 4). After adjusting for additional blocks of covariates, the rates of hospitalization for the low-moderate and moderate-high groups seemed to converge. In the baseline health model (Model 4), the IRRs for the low-moderate and moderate-high groups were 0.86 (95% CI, 0.74–0.99; $p = .039$) and 0.84 (95% CI, 0.70–1.01; $p = .057$). Finally, there was no interaction between SPA and sex, and thus, sex-specific analyses were not pursued.

DISCUSSION

In the present study, we found that positive self-perceptions of aging were associated with a lower rate of self-reported overnight hospitalization over four years among a nationally representative sample of adults over age 50. Consistent with our hypothesis, the association remained significant even after adjusting for a comprehensive list of sociodemographic, baseline health, and health behavior variables. In the sociodemographic model, every SD increase in SPA was linked to a lower rate of hospitalization. A dose-response relationship was found when SPA was divided into quartiles, suggesting that older adults derive additional benefits from having more positive views of aging. Compared to those with the lowest level of SPA, those with low-moderate, moderate-high, and high SPA had a 33%, 36%, and 55% lower rate of hospitalization, respectively. While the study by Moser and colleagues (22) did not find an association between self-perceptions of aging and hospitalization beyond the first year of follow-up, we found a consistent relationship across all four years. Excluding hospitalizations that occurred within two years of baseline did not significantly change the strength of association between SPA and hospitalization.

Levy's stereotype embodiment theory (8) suggests that self-perceptions of aging derive from the internalization of aging stereotypes present in American society. However, there are likely differences in the degree of internalization by age, sex, race/ethnicity, and health-related factors. In the present study, we found a small negative correlation between age and SPA, suggesting that older adults may experience small drops in SPA over time. The literature on the relationship between age and SPA, however, is mixed, with some studies showing no significant age differences in SPA across the adult lifespan (37) and others showing a steady pattern of decline in SPA in older adulthood (38). While we found women to have more positive self-perceptions of aging, the research on sex differences in SPA has also yielded conflicting results regarding which sex tends to view aging in a more positive light (38). In terms of race/ethnicity, we found respondents who identified as Black/African

American to have more positive SPA compared to Whites/Caucasians. There are currently relatively few studies that focus on racial differences in SPA, and the literature would benefit from studies that consider how views of aging may differ between racial groups and whether race interacts with SPA to influence health care use. In general, the relationship between SPA and various sociodemographic factors is unclear and tends to change depending on the other factors that are accounted for in any given model.

The link between health and SPA, on the other hand, seems more well-established. In general, older adults who are in good health are more likely to have positive attitudes towards aging. In the current study, individuals with fewer chronic conditions, fewer depressive symptoms, and/or fewer ADL limitations tended to have more positive self-perceptions of aging. Kleinspehn-Ammerlahn and colleagues (38) found similar findings using data from the Berlin Aging Study: participants who had fewer chronic illnesses, felt less lonely, and had higher cognitive functioning were more likely to be satisfied with their aging experience. Conversely, by identifying subgroups of the population who are likely to have poorer self-perceptions of aging, we can take a more targeted approach to providing resources for those who are at risk of negative health outcomes like hospitalization.

In addition to identifying the factors that contribute to an individual's self-perception of aging, we must also delve deeper into the pathways that connect older adults' evaluation of their aging experience to their utilization of health care resources. In the present study, we included a variety of health and health behavior variables that we believed to influence the relationship between SPA and overnight hospitalization. Future studies should continue to investigate the psychological, behavioral, and physiological processes that influence health care use. While we are not aware of any existing studies that formally test the mechanisms that link SPA to overnight hospitalization, Levy and colleagues (39) showed how strengthening positive age stereotypes can reinforce positive self-perceptions of aging, which in turn, can improve physical functioning (e.g., strength, gait, balance). A more complete understanding of the mechanisms that link SPA to health care use will better inform efforts to improve the health and well-being of the aging population.

While the majority of studies have focused on how self-perceptions of aging influence health outcomes, one area for further exploration would be to examine how SPA influence the way in which older adults interact directly with the health care system. Previous research suggests that negative expectations regarding aging can result in delays in seeking appropriate health care, leading to an increased risk for hospitalization. In one study of community-dwelling older adults, those who held more negative views of aging were less likely to believe in the importance of discussing age-related issues such as depression, arthritis, and memory impairment with their doctors (40). On the other hand, older adults with positive self-perceptions of aging are more likely to use preventive health services (e.g., cholesterol tests, mammograms, prostate exams) (41). Thus, improving self-perceptions of aging may be important in not just promoting health but also encouraging older adults to be more proactive in seeking care.

The present study establishes a link between SPA and overnight hospitalization, but more work is needed to understand if, how, and to what extent self-perceptions of aging can be

reliably altered to improve health outcomes and decrease rates of hospitalization. If “old age” is considered a causal factor that is internal, stable, and uncontrollable, older adults may have little incentive to change their behavior or seek help for worrisome symptoms. In one study, older adults who attributed a recent heart attack/stroke to “old age” were less likely to make lifestyle changes and more likely to be hospitalized over the next three years (42). If, on the other hand, older adults view aging as a process of growth and adaptation, they may be more likely to attribute age-related changes to modifiable external factors and actively engage in protective health behaviors. Therefore, programs that specifically target older adults’ evaluations of their aging experience may be especially effective in empowering older adults to take control of their health. Recent studies have attempted to improve older adults’ expectations about aging through both explicit (43,44) and implicit (39) interventions. Short-term intervention studies suggest that aging expectations are not only modifiable but can also give rise to significant changes in health behaviors (43,44) and physical functioning (39). Furthermore, recent research has shown that complex biopsychosocial health care needs among older adults are associated with adverse health outcomes and higher health care costs (45), suggesting that a focus on improving SPA and other psychosocial factors (46, 47) may result in better health and substantial cost savings for adults entering their later years.

The current study adds to the literature on self-perceptions of aging and health by demonstrating a strong and sustained relationship between SPA and self-reported hospitalizations over a four-year follow-up. The study’s findings are strengthened by the use of a large and nationally representative sample of adults over the age of 50 and the thoughtful inclusion of covariates. This study, however, also has several limitations. Although research has shown high concordance between self-reported hospital visits and Medicare claims (31), future studies should consider linking data to actual health care records to reduce the likelihood of recall bias. Also, the present study examined all-cause hospitalization and did not include information on the specific reason for admission. The Health and Retirement Study includes additional measures of health care utilization (e.g., doctor visits, nursing home stays, outpatient surgeries), and future research should consider how SPA influence the use of other health care resources. In addition, the study sample was restricted to individuals who survived the four-year follow-up period and may, therefore, underestimate the impact of health-related factors on the risk for hospitalization. Participants with the most negative SPA may have been excluded from the sample because they were in poor health at baseline and died over follow-up. Finally, we aimed to address the issue of reverse causality by 1) adjusting for health-related factors at baseline and 2) excluding hospitalizations that occurred within the first two years of follow-up, but we cannot completely eliminate the possibility that health conditions related to the risk for hospitalization may be influencing individuals’ perceptions of their aging experience.

As a society, we can all play a critical role in helping individuals develop more positive self-perceptions of aging. Health care providers can help mitigate the effects of negative age stereotypes by reinforcing the idea that mental and physical decline are not inevitable in old age. Policymakers can propose new programs that emphasize the ability of older adults to adopt healthy and active lifestyles despite age-related declines. The media can disseminate more positive messages regarding the process of aging. Finally, we can all increase our

awareness of the effects that age stereotypes have on the health and well-being of older adults and be more deliberate in the ways we communicate with each other regarding what it means to age successfully.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Glossary

SPA	self-perceptions of aging
HRS	Health and Retirement Study
EFTE	enhanced face-to-face
ADL	activity of daily living
IRR	incidence rate ratio
SD	standard deviation

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FIGURE 1.

Sample inclusion criteria. In a rotating design, a random 50% of the Health and Retirement Study longitudinal panel is selected for an enhanced face-to-face (EFTF) interview to collect physical measures, biomarkers, and psychosocial data. The Psychosocial and Lifestyle Leave-Behind Questionnaire includes the measure of self-perceptions of aging. Section N asks about Health Services and Insurance, including number of hospitalizations over the

previous two years. This flow chart was created using the HRS 2012 Cross-Wave Tracker File and HRS Core Final Release Data from 2006, 2008, 2010, and 2012.

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TABLE 1

Descriptive Statistics from the Analytic Study Sample (n = 4735)^a

	Self-Perceptions of Aging			
	Low (n = 1254)	Low-Moderate (n = 1292)	Moderate-High (n = 1008)	High (n = 1181)
Age, M (SD)	70.28 (9.24)	69.81 (9.02)	68.38 (8.65)	67.39 (7.82)
Female, %	63.16	58.59	61.41	59.27
Race/Ethnicity, % ^b				
White	74.48	78.33	76.09	80.36
Black	12.28	10.22	13.79	12.28
Hispanic	11.00	9.52	8.43	5.59
Other	2.23	1.93	1.69	1.78
Educational attainment, %				
<High school	25.12	21.67	13.89	11.60
High school	56.86	53.48	55.75	52.67
College	18.02	24.85	30.36	35.73
Living alone, %	27.51	25.46	21.83	19.81
Total household wealth, % ^b				
1st quintile	28.39	21.44	16.77	13.38
2nd quintile	25.04	21.44	17.16	14.99
3rd quintile	19.14	19.81	20.83	19.81
4th quintile	16.43	19.12	23.12	22.10
5th quintile	11.00	18.19	22.12	29.72
Insured, %	95.93	95.90	96.53	96.44
Depressive symptoms, M (SD)	2.52 (2.34)	1.26 (1.72)	0.76 (1.34)	0.46 (0.98)
Chronic illnesses, M (SD)	2.82 (1.47)	2.22 (1.37)	1.99 (1.25)	1.65 (1.21)
ADL limitations, M (SD)	0.50 (1.00)	0.20 (0.62)	0.10 (0.45)	0.03 (0.22)
Previous hospitalizations, M (SD)	1.16 (1.79)	0.71 (1.31)	0.61 (1.20)	0.42 (0.94)
Smoking status, % ^b				
Never	40.91	44.35	46.33	46.23
Former	44.82	44.50	42.76	43.35
Current	14.27	11.15	10.91	10.41
Exercise frequency, % ^b				
Never	29.03	16.72	11.01	7.62
1–4×/month	24.96	24.23	24.60	20.58
>1×/week	46.01	59.06	64.38	71.80
Alcohol frequency (d/wk), % ^b				
Never	56.78	49.23	46.53	38.95
<1	17.46	17.80	17.76	18.12

	Self-Perceptions of Aging			
	Low (n = 1254)	Low-Moderate (n = 1292)	Moderate-High (n = 1008)	High (n = 1181)
1-2	14.04	16.18	17.36	19.64
3+	11.72	16.80	18.35	23.29

^aUnweighted sample data

^bPercentages may not sum to 100% due to rounding

TABLE 2

Negative Binomial Regression Models of Self-Perceptions of Aging and Incidence Rate Ratios for Overnight Hospitalization

Model	Covariates	IRR (95% CI)	<i>p</i>
1	Unadjusted	0.69 (0.66–0.73)	< .001
2	Age + sex	0.71 (0.67–0.75)	< .001
3	Sociodemographic ^a	0.75 (0.71–0.80)	< .001
4	Sociodemographic ^a + baseline health ^b	0.90 (0.85–0.96)	.001
5	Sociodemographic ^a + health behaviors ^c	0.78 (0.74–0.82)	< .001
6	All covariates ^d	0.90 (0.85–0.95)	.001

^aSociodemographic: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status

^bBaseline health: depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations

^cHealth behaviors: smoking status, exercise frequency, alcohol frequency

^dAll covariates: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status, depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations, smoking status, exercise frequency, alcohol frequency

TABLE 3

Negative Binomial Regression Models of Self-Perceptions of Aging and Incidence Rate Ratios for Overnight Hospitalization, Follow-up Years 1 & 2 versus Follow-up Years 3 & 4

Model	Covariates	Follow-up Years 1 & 2		Follow-up Years 3 & 4	
		IRR (95% CI)	p	IRR (95% CI)	p
1	Unadjusted	0.69 (0.65–0.74)	< .001	0.70 (0.65–0.74)	< .001
2	Age + sex	0.71 (0.66–0.77)	< .001	0.71 (0.66–0.76)	< .001
3	Sociodemographic ^a	0.75 (0.70–0.81)	< .001	0.76 (0.71–0.81)	< .001
4	Sociodemographic ^a + baseline health ^b	0.92 (0.85–1.00)	.041	0.90 (0.84–0.96)	.002
5	Sociodemographic ^a + health behaviors ^c	0.78 (0.72–0.84)	< .001	0.78 (0.73–0.83)	< .001
6	All covariates ^d	0.92 (0.85–0.99)	.035	0.89 (0.84–0.95)	.001

^aSociodemographic: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status

^bBaseline health: depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations

^cHealth behaviors: smoking status, exercise frequency, alcohol frequency

^dAll covariates: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status, depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations, smoking status, exercise frequency, alcohol frequency

TABLE 4

Negative Binomial Regression Models of Quartiles of Self-Perceptions of Aging and Incidence Rate Ratios for Overnight Hospitalization

Model	Covariates	SPA Quartile	IRR (95% CI)	<i>p</i>
1	Unadjusted	Low (Reference)	1.00	
		Low-Moderate	0.66 (0.56–0.77)	< .001
		Moderate-High	0.58 (0.46–0.72)	< .001
		High	0.36 (0.29–0.43)	< .001
2	Age + sex	Low (Reference)	1.00	
		Low-Moderate	0.63 (0.53–0.75)	< .001
		Moderate-High	0.59 (0.46–0.75)	< .001
		High	0.37 (0.30–0.46)	< .001
3	Sociodemographic ^a	Low (Reference)	1.00	
		Low-Moderate	0.67 (0.57–0.79)	< .001
		Moderate-High	0.64 (0.52–0.80)	< .001
		High	0.45 (0.37–0.55)	< .001
4	Sociodemographic ^a + baseline health ^b	Low (Reference)	1.00	
		Low-Moderate	0.86 (0.74–0.99)	.039
		Moderate-High	0.84 (0.70–1.01)	.057
		High	0.72 (0.60–0.85)	< .001
5	Sociodemographic ^a + health behaviors ^c	Low (Reference)	1.00	
		Low-Moderate	0.71 (0.61–0.82)	< .001
		Moderate-High	0.69 (0.55–0.85)	.001
		High	0.49 (0.40–0.59)	< .001
6	All covariates ^d	Low (Reference)	1.00	
		Low-Moderate	0.86 (0.74–0.99)	.038
		Moderate-High	0.83 (0.70–0.99)	.039
		High	0.71 (0.60–0.84)	< .001

^aSociodemographic: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status

^bBaseline health: depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations

^cHealth behaviors: smoking status, exercise frequency, alcohol frequency

^dAll covariates: age, sex, race/ethnicity, educational attainment, living arrangement, total household wealth, health insurance status, depressive symptoms, chronic illnesses, ADL limitations, previous hospitalizations, smoking status, exercise frequency, alcohol frequency