

Self-Rated Current and Future Health Independently Predict Subsequent Mortality in an Aging Population

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Background. Self-rated current health is an independent, robust predictor of subsequent mortality in older adults. Investigators hypothesize that individuals likely take into account their future health when reporting their current health. However, few have measured and examined self-rated future health in relation to mortality.

Methods. We investigate the effect of three self-rated health measures on 10-year mortality in 2091 men and women in an aging cohort: (i) self-rated current health, (ii) self-rated future health (1 year in the future), and (iii) a combined measure of current and future health. Vital status at follow-up year 10 was the outcome. We used data from SPPARCS (Study of Physical Performance and Age-Related Changes in Sonomans), a population-based, census-sampled, study of the epidemiology of aging, health, and functioning.

Results. Compared to those reporting their future health as better/same, participants reporting their future health as worse or unknown (don't know) experienced elevated 10-year mortality (adjusted rate ratio [RR] = 1.6, 95% confidence interval [CI], 1.2–2.1, $p = .01$), after adjustment for self-rated current health and other relevant covariates. The combined measure of current and future health also contributed important information. Compared to the referent (the best combination, current health excellent/good and future health better/same), participants reporting the worst combination, fair/poor current health and worse/unknown future health, experienced the highest 10-year mortality in the cohort (adjusted RR = 3.2, 95% CI, 2.2–4.7, $p = .00$).

Conclusions. Self-rated future health is an independent, robust predictor of mortality. It is as predictive of subsequent mortality in older adults as the standard measure of self-rated current health. Furthermore, a measure that combines self-reports of current health with future health was most useful in the identification of older adults with the highest mortality rates. Thus, the combined measure of current and future health may be most useful in practice, in distinguishing the differential mortality rates among persons reporting fair or poor self-rated current overall health.

SELF-report of current overall health is one of the most robust predictors of mortality in older adults. Beginning with evidence from the Manitoba Longitudinal Study (1) and the Alameda County Study (2), followed by results from > 30 population-based studies from all over the world (3), investigators have established overwhelming evidence that self-rated current overall health is associated with subsequent mortality in older populations.

Overall health is usually ascertained by asking study participants a very simple question: Overall, how would you rate your health? “Excellent,” “Good,” “Fair,” or “Poor.” Those who reported poorer current health have higher rates of mortality and functional decline, compared to respondents who reported excellent or good current health. This association remains robust (effect measure approximately 2.0) after adjustment for objective measures of health (e.g., physician-confirmed chronic conditions and morbidities) and for other covariates likely to explain the association between self-rated current health and subsequent mortality (4,5).

Research has focused on the criteria used by people to assess and report their own current health. People seem to tap into many types of information about themselves when asked to assess their own health. People may consider any combination of the following (3,6–8): (i) family, life, or medical history; (ii) past health status; (iii) capacity to do everyday tasks; (iv) self- and preventive care and adherence to medical or preventive advice; (v) resources including

social support and access to care; and (vi) social factors including gender and social positioning.

Results from this research suggest that individuals may have an overall “sense” of their *current* health that is extraordinarily predictive of their *future* health, which, in turn, predicts their subsequent survival. Along these lines, we investigate the relationship between 10-year mortality in an aging cohort and three overall health status measures: (i) self-rated current overall health, (ii) self-rated health 1 year in the future, and (iii) a combined measure of current and future health. To our knowledge, there have been no prior studies examining the association between self-assessments of one's own future health and subsequent mortality.

METHODS

Population

This study used data collected from a community-based longitudinal study of the epidemiology of aging, health, and functioning: The Study of Physical Performance and Age-Related Changes in Sonomans (SPPARCS). Cohort characteristics by selected baseline variables appear in Table 1. Details of the recruitment and census-sampling procedures have been reported (9). Baseline examination was conducted in 1993 and included home interviews and laboratory assessments of a sample of 2091 residents of Sonoma,

Table 1. Description of the SPPARCS Cohort by Selected Characteristics

Variable	N	Percent %
Age, y		
53–59	272	13
60–69	706	34
70–79	770	37
80–97	343	16
Sex		
Female	1245	60
Male	846	40
Marital status		
Married	1296	62
Divorced	231	11
Separated	16	.77
Widowed	458	22
Never married	90	4.3
No. of people in household		
1	614	29
2	1343	64
3	95	4.5
4+	39	1.9
No. of social contacts (family and friends)		
0–1	55	2.6
2–4	260	12
5–10	881	42
11+	835	40
Missing	60	2.9
Self-rated current overall health		
Excellent/Good	1706	82
Fair/Poor	377	18
Missing	8	.38
Self-rated future health (1 y in the future)		
Better/Same	1850	88
Worse/Don't Know	198	9.5
Missing	43	2.1
Combined current and future health		
Current excellent/good and future better/same	1571	75
Current excellent/good and future worse or don't know	117	5.6
Current fair/poor and future better/same	274	13
Current fair/poor and future worse or don't know	78	3.7
Missing	51	2.4
No. of medical prescriptions		
0	464	22
1	430	21
2	393	19
3	306	15
4+	496	24
Missing	2	.10
No. of comorbidities		
0	184	8.8
1	322	15
2	380	18
3	384	18
4+	821	39
Cognitive impairment		
No	1534	73
Yes	424	20
Missing	133	6.4

Table 1. Description of the SPPARCS Cohort by Selected Characteristics (*Continued*)

Variable	N	Percent %
Physical function impairment		
No	1503	72
Yes	588	28
Depression (based on CES-D score)		
No (score < 16)	1771	85
Yes (score ≥ 16)	182	8.7
Missing	138	6.6

Note: SPPARCS = Study of Physical Performance and Age-Related Changes in Sonomans; CES-D = Center for Epidemiologic Studies Depression.

California, who were 53 years old or older. Follow-up examinations were conducted every 2 years in three waves, in 1995, 1997, and 1999, respectively. Ongoing vital status updates were implemented, and a full-cohort vital status update was completed on August 15, 2003. Informed written consents were obtained from participants at baseline and at each follow-up. Study protocols were approved by the Committees for the Protection of Human Subjects at the University of California, Berkeley, and the University of California, San Francisco.

Ascertainment and Analysis of Overall Health Measures

Participants were asked to rate their current overall health: “How would you describe your overall health—excellent, good, fair, poor, or don’t know?” Additionally, they were asked about their overall health 1 year into the future, relative to their current health status: “Next year, would you predict that your overall health will be better, about the same, worse, or don’t know?” Both self-rated health measures were examined with respect to 10-year mortality first by retaining all the categories of responses to each question. Then, age-specific estimates, as well as age-specific estimates adjusted for all covariates, were obtained (Table 2). Age-specific estimates were obtained by categories: 60–69, 70–79, and 80–97; age category 53–59 was excluded from this analysis because there were only 10 deaths (too few deaths) over the 10-year follow-up period. Categories of self-rated current and future health measures were collapsed according to standard guidelines (10) to maximize estimate stability as well as precision across categories.

Following the examination of self-rated current and future health measures, a combined measure of current and future health was created as another way (in addition to mutual adjustment in the fully saturated main effects model) to assess whether the two self-rated health measures had independent effects on 10-year mortality. First, all possible combinations of responses to both measures were created. Estimates were examined using the same process as described above, according to standard recommendations (10). The combined current and future health measure had four categories: Category 1: excellent/good current health + better/same future health; Category 2: excellent/good current health + worse/unknown future health; Category 3: fair/poor current health + better/same future health; and Category 4: fair/poor current health + worse/unknown future health.

Table 2. Age-Specific (Age Categories 53–59, 60–69, 70–79, 80–97) 10-Year Mortality Rates, Unadjusted, and Adjusted Rate Ratios by the Three Overall Health Measures (Current, Future, and Combined Current/Future) in the SPPARCS Cohort

Variables	N	No. Dead	Person-Years	Mortality		Crude RR [‡]	95% CI	p	Adjusted		
				Rate per 1000*	95% CI* [†]				RR [§]	95% CI	p
Age category 53–59 y	272	10	2500	4.0	(1.5, 6.5)	1.0	—	—	1.0	—	—
Self-rated current overall health											
Excellent	134	4	1247	3.2	(0.06, 6.4)	1.0	—	—	NA	NA	NA
Good	122	4	1118	3.6	(0.07, 7.1)	1.1	(0.27, 4.5)	.88			
Fair	14	2	115.3	17.3	(0, 41)	5.4	(0.98, 29)	.05			
Poor	2	0	19.36	—	—	—	—	—			
Self-rated future overall health											
Better	110	4	1014	3.9	(0.08, 7.8)	1.0	—	—	NA	NA	NA
Same	152	4	1405	2.8	(0.06, 5.6)	0.72	(0.18, 2.9)	.64			
Worse	3	1	24.42	41	(0, 121)	10	(1.1, 92)	.04			
Don't know	7	1	56.98	18	(0, 52)	4.4	(0.49, 39)	.19			
Combined current/future health measure											
Current exl/g & future b/s	247	6	2294	2.6	(0.5, 4.7)	1.0	—	—	NA	NA	NA
Current exl/g & future w/dk	9	2	71.50	28	(0, 67)	11	(2.1, 52)	.00			
Current f/p & future b/s	15	2	124.7	16	(0, 38)	6.1	(1.2, 30)	.03			
Current f/p & future w/dk	1	0	9.9	—	—	—	—	—			
Age category 60–69 y	706	88	6391	14	(11, 17)	3.5	(1.8, 6.6)	.00	2.8	(1.4, 5.7)	.00
Self-rated current overall health											
Excellent	235	21	2169	9.7	(5.5, 14)	1.0	—	—	1.0	—	—
Good	368	45	3373	13	(9.4, 17)	1.4	(0.82, 2.3)	.22	0.91	(0.45, 1.8)	.80
Fair	91	20	748.8	27	(15, 38)	2.8	(1.5, 5.2)	.00	2.6	(1.1, 6.3)	.22
Poor	9	2	71.72	28	(0, 67)	3.0	(0.70, 13)	.14	4.3	(0.41, 45)	.41
Self-rated future overall health											
Better	194	24	1761	14	(8.2, 19)	1.0	—	—	1.0	—	—
Same	466	55	4247	13	(9.5, 16)	0.95	(0.59, 1.5)	.83	0.78	(0.43, 1.4)	.41
Worse	20	4	167.0	24	(0.48, 47)	1.8	(0.61, 5.1)	.29	1.1	(0.29, 4.4)	.85
Don't know	22	3	191.0	15	(0, 33)	1.2	(0.35, 3.8)	.81	0.81	(0.18, 3.6)	.78
Combined current/future health measure											
Current exl/g & future b/s	577	62	5317	12	(8.8, 15)	1.0	—	—	1.0	—	—
Current exl/g & future w/dk	24	4	204.8	20	(0.40, 39)	1.7	(0.61, 4.6)	.31	1.3	(0.35, 4.8)	.70
Current f/p & future b/s	18	17	671.8	25	(13, 37)	2.2	(1.3, 3.8)	.00	3.0	(1.5, 6.0)	.00
Current f/p & future w/dk	17	3	143.4	21	(0, 45)	1.8	(0.57, 5.8)	.31	2.9	(0.74, 12)	.12
Age category 70–79 y	770	243	6335	39	(34, 44)	9.8	(5.2, 18)	.00	6.0	(3.0, 12)	.00
Self-rated current overall health											
Excellent	222	45	1963	23	(16, 30)	1.0	—	—	—	—	—
Good	384	113	3226	35	(29, 41)	1.5	(1.1, 2.2)	.01	1.2	(0.80, 1.9)	.35
Fair	140	68	1022	67	(51, 82)	3.0	(2.1, 4.4)	.00	2.2	(1.2, 3.8)	.01
Poor	23	17	113.9	149	(78, 220)	7.5	(4.5, 13)	.00	3.5	(1.4, 8.8)	.01
Self-rated future overall health											
Better	163	54	1324	41	(30, 52)	1.0	—	—	—	—	—
Same	510	140	4332	32	(27, 38)	0.78	(0.57, 1.1)	.13	1.1	(0.74, 1.6)	.64
Worse	39	19	268.4	71	(39, 103)	1.8	(1.1, 3.0)	.03	1.8	(0.92, 3.3)	.09
Don't know	48	24	352.2	68	(41, 95)	1.7	(1.1, 2.8)	.03	1.6	(0.87, 3.6)	.13
Combined current/future health measure											
Current exl/g & future b/s	549	135	4754	28	(24, 33)	1.0	—	—	—	—	—
Current exl/g & future w/dk	54	21	415.6	51	(29, 72)	1.8	(1.2, 2.9)	.01	1.5	(0.84, 2.6)	.18
Current f/p & future b/s	123	59	892.5	66	(49, 83)	2.4	(1.8, 3.3)	.00	1.8	(1.1, 2.8)	.01
Current f/p & future w/dk	33	33	205.0	161	(106, 216)	4.1	(2.6, 6.5)	.00	3.1	(1.7, 5.7)	.00
Age category 80–97 y	343	216	2199	98	(85, 111)	26	(14, 50)	.00	14	(7.0, 30)	.00
Self-rated current overall health											
Excellent	72	36	542.5	66	(45, 88)	1.0	—	—	—	—	—
Good	169	102	1127	91	(73, 108)	1.4	(0.95, 2.0)	.09	1.0	(0.62, 1.7)	.89
Fair	66	51	359.9	142	(103, 181)	2.3	(1.5, 2.0)	.00	2.0	(1.0, 4.0)	.04
Poor	32	24	150.8	159	(95, 223)	2.7	(1.6, 4.5)	.00	1.2	(0.40, 3.5)	.76

Table 2. Age-Specific (Age Categories 53–59, 60–69, 70–79, 80–97) 10-Year Mortality Rates, Unadjusted, and Adjusted Rate Ratios by the Three Overall Health Measures (Current, Future, and Combined Current/Future) in the SPPARCS Cohort (Continued)

Variables	N	No. Dead	Person-Years	Mortality		Crude RR [‡]	95% CI	p	Adjusted		
				Rate per 1000*	95% CI* [†]				RR [§]	95% CI	p
Self-rated future overall health											
Better	68	42	438.9	96	(67, 125)	1.0	—	—	1.0	—	—
Same	187	103	1316	78	(63, 93)	0.81	(0.57, 1.2)	.25	0.72	(0.42, 1.2)	.24
Worse	23	17	130.2	131	(69, 193)	1.4	(0.80, 2.5)	.23	1.9	(0.89, 4.3)	.09
Don't know	36	28	190.5	147	(93, 201)	1.6	(0.99, 2.6)	.06	1.7	(0.83, 3.6)	.14
Combined current/future health measure											
Current exl/g & future b/s	198	107	1402	76	(62, 91)	1.0	—	—	1.0	—	—
Current exl/g & future w/dk	30	29	194.3	149	(95, 204)	1.4	(0.85, 2.2)	.19	1.2	(0.61, 2.5)	.55
Current f/p & future b/s	55	36	348.5	103	(70, 137)	1.4	(0.96, 2.1)	.08	1.3	(0.73, 2.4)	.37
Current f/p & future w/dk	27	24	120.0	200	(120, 280)	3.2	(2.1, 5.1)	.00	6.0	(2.8, 13)	.00

Notes: *The age-specific 10-year mortality rates and corresponding 95% CI values are reported per 1000 person-years.

[†]Lower bound of CI truncated at zero.

[‡]Crude mortality RR estimated using Cox Proportional Hazards Model.

[§]Adjusted age-stratified estimates were obtained using Cox Proportional Hazards Model for age categories 60–69, 70–79, and 80–97. There were too few deaths in age category 53–59 to obtain stable estimates. Self-rated current health and self-rated future health were adjusted for all relevant covariates, including self-rated current health, self-rated future health, sex, marital status, birthplace, education, ethnicity, employment status, household income, number of people in the household, smoking status, alcohol consumption, supplement use, standardized physical activity level, civic engagement, number of social contacts, number of prescription medications, number of over-the-counter medications, number of symptoms, number of diagnosed diseases, physical function, cognitive function, and depression. Combined current/future health measures were adjusted for all relevant covariates, including sex, marital status, birthplace, education, ethnicity, employment status, household income, number of people in the household, smoking status, alcohol consumption, supplement use, standardized physical activity level, civic engagement, number of social contacts, number of prescription medications, number of over-the-counter medications, number of symptoms, number of diagnosed diseases, physical function, cognitive function, and depression.

SPPARCS = Study of Physical Performance and Age-Related Changes in Sonomans; CI = confidence interval; RR = rate ratio; NA = not estimated due to too few deaths over 10-year follow-up; exl = excellent; g = good; b = better; s = same; w = worse; dk = don't know.

Vital Status Updates

Assessment of vital status was conducted in several ways. Standardized active surveillance was used in combination with verification procedures. Study staff conducted a daily review of obituary records in the local newspaper and a monthly review of Sonoma County death certificates. Copies of the death certificates were obtained and were reviewed and verified by physician consultants. The exact dates (month, day, and year) of deaths were recorded.

Covariates

Information on covariates was obtained as part of the baseline examination. Covariates were selected based on established correlates and confounders of self-rated health and mortality. Covariates covered a wide range of domains thought to account for the association between self-rated health and subsequent mortality in the aging population, including: (i) sociodemographic and household characteristics, (ii) health practices, (iii) social engagement, (iv) clinical indicators of health status, and (v) standardized measures of health and functioning.

Sociodemographic and household characteristics include age (53–97), gender, marital status (married, divorced, separated, widowed, never married), race-ethnicity (white, black, other), birthplace (United States-born, foreign born), education (< 12 years, 12 years, some college, college graduate, > college), employment (working, not working, retired), annual household income (in U.S. dollars, < \$10,000; \$10,000–\$14,999; \$15,000–\$19,999; \$20,000–\$24,999;

\$25,000–\$29,999; \$30,000+), and number of people residing in the household (1, 2, 3, 4+).

Health practices include smoking status (current, former, never), alcohol consumption (yes/no), vitamin use (yes/no), and physical activity (standard metabolic equivalent [MET] in standardized ordinal scale, < 4, 4, ≥4–6, > 6 METs). MET is the ratio of the metabolic rate for a specific activity divided by the basal metabolic rate.

Social engagement is the number of social contacts (0–1, 2–4, 5–10, 11+) and civic engagement (number of community-based organizations in which the participant is engaged in volunteer work: 0, 1, 2, 3+).

Self-reports of clinical indicators of health are the number of prescription medications (0, 1, 2, 3, 4+), number of over-the-counter medications (0, 1, 2, 3, 4+), number of symptoms in the past month (0–4, 5–9, 10–14, 15+), and number of diagnosed chronic conditions and morbidities (0, 1, 2, 3, 4+).

Health and functioning were determined by level of difficulty in the completion of generic functional tasks based on questions from Rosow and Breslau (11) and Nagi (12). Cognitive functioning impairment (yes/no) was determined based on the overall level of cognitive functioning from the Folstein Mini-Mental State Examination–Folstein (13). Depression (yes/no) was classified based on the standardized cut point of ≥16 on the Center for Epidemiologic Studies Depression (CES-D) scale (14).

Statistical Analysis

Crude 10-year mortality rates were estimated by dividing the number of deaths by the total cohort follow-up time.

Age-specific mortality rates were estimated by four categories (ages 53–59, 60–69, 70–79, 80–97). Age-specific mortality rates were also presented by the three overall health assessments (Table 2). Mortality rates and corresponding 95% confidence intervals (CI) were presented per 1000 person-years. The lower bounds of the 95% CIs were truncated at 0 given that rates are, by definition, > 0.

This analysis is a standard fixed cohort analysis, as vital status was obtained for all cohort members who completed baseline protocols. Person-time (in years) was calculated based on the baseline interview date to the date of death prior to August 15, 2003, or August 15, 2003.

Cox proportional hazards models were used to estimate adjusted mortality rate ratios (RRs) and two-sided 95% CIs. All analyses were conducted using Stata, version 9.0 (College Station, TX) (15). Cox regression models with increasing numbers of covariates were used to evaluate the residual effect on mortality of the three health measures. Beginning with unadjusted 10-year mortality RRs for each health measure, we built models that were adjusted for progressively increasing number of covariates. Covariates were added by variable domains in blocks.

RESULTS

A total of 2091 cohort members contributed 17,424 at-risk person-years over 10 follow-up years. Each cohort member contributed, on average, 8.3 person-years (standard deviation 2.4 person-years; median 9.2 person-years; minimum 0.22 and maximum 10.3 person-years). During this period, 557 cohort members died. The crude 10-year mortality rate of the cohort was 32/1000 person-years (95% CI, 29/1000–31/1000). The mortality rate increased with increasing age (Table 2, age-specific mortality rates). In each 10-year age category, the age-specific mortality rates were lowest among participants who reported excellent/good current health, and among those who reported better/same future health, as well as among those whose combined current and future health was: current health excellent/good and future health better/same. The mortality rates increased as the corresponding ratings of current health, future health, and combined current and future health were progressively worse (Table 2). No gender differences were observed in reports of current or future health. The effect on mortality of each of the three health measures did not differ by age category, although the estimates fluctuated across categories of responses, due to small sample size in the younger ages. There was no correlation between the self-rated current and future health measure (Spearman $\rho = 0.003, p = .89$).

Self-reported current health was independently associated with 10-year mortality (Table 3). Compared to participants who reported their current health as excellent/good (after adjustment for age, gender, and future health), those who reported their current health as fair/poor had elevated 10-year mortality (RR fair/poor = 2.0, 95% CI, 1.7–2.5; $p = .00$). The mortality RR remained elevated in the full model (Model 7) for participants who reported their current health as fair/poor (RR fair/poor = 1.8, 95% CI, 1.4–2.3; $p = .01$), compared to those who reported their current health as excellent/good.

Table 3. Effect Self-Reports of Health at Baseline on Mortality at Follow-Up Year 10 in the SPPARCS Cohort

Variables	Crude RR (95% CI) p	Adjusted 1 RR (95% CI) p	Adjusted 2 RR (95% CI) p	Adjusted 3 RR (95% CI) p	Adjusted 4 RR (95% CI) p	Adjusted 5 RR (95% CI) p	Adjusted 6 RR (95% CI) p	Adjusted 7 RR (95% CI) p
Self-rated current health								
Excellent/Good	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –
Fair/Poor	2.9 (2.4, 3.5) .00	2.4 (2.0, 2.9) .00	2.0 (1.7, 2.5) .00	2.1 (1.7, 2.6) .00	2.0 (1.6, 2.4) .00	2.0 (1.6, 2.5) .00	1.8 (1.4, 2.2) .00	1.8 (1.4, 2.3) .01
Self-rated future health								
Better/Same	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –
Worse/Don't Know	2.6 (1.8, 3.7) .00	2.2 (1.7, 2.7) .00	1.6 (1.3, 2.0) .00	1.7 (1.3, 2.2) .00	1.7 (1.3, 2.1) .00	1.7 (1.3, 2.2) .00	1.6 (1.3, 2.1) .00	1.6 (1.2, 2.1) .01
Combined current/future health measure*								
Current ex/g & Future b/s	1.0 –	NA	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –	1.0 –
Current ex/g & Future w/dk	2.4 (1.8, 3.3) .00		1.5 (1.1, 2.0) .02	1.5 (1.1, 2.2) .01	1.5 (1.1, 2.2) .01	1.5 (1.0, 2.1) .04	1.4 (.98, 2.0) .11	1.4 (.93, 2.0) .22
Current f/p & Future b/s	2.6 (2.1, 3.2) .00		1.9 (1.6, 2.4) .00	2.0 (1.6, 2.5) .00	1.9 (1.5, 2.4) .00	1.9 (1.5, 2.4) .00	1.6 (1.3, 2.1) .03	1.7 (1.2, 2.2) .06
Current f/p & Future w/dk	5.0 (3.7, 6.7) .00		3.4 (2.5, 4.7) .00	3.9 (2.8, 5.4) .00	3.5 (2.5, 4.9) .00	3.7 (2.7, 5.2) .00	3.1 (2.2, 4.6) .00	3.2 (2.2, 4.7) .00

Notes: Crude was unadjusted 10-year mortality rate ratio (RR, estimated using Cox proportional hazards regression) for the given overall health assessment. Adjusted 1 was adjusted for self-reported current overall health and self-rated future health (1 year in the future). Adjusted 2 was adjusted for self-reported current overall health and self-assessed future health + age (continuous), sex (for combined measure: age [continuous] and sex. Adjusted 3 was adjusted for variables in previous model (Model 2) + marital status, birthplace, education, ethnicity, employment status, household income, and number of people in the household. Adjusted 4 was adjusted for variables in previous model (Model 3) + current smoking status, current alcohol consumption, current supplement use, and standardized physical activity level. Adjusted 5 was adjusted for variables in previous model (Model 4) + number of social contacts (family and friends nearby) and civic engagement (volunteering). Adjusted 6 was adjusted for variables in previous model (Model 5) + number of prescription medications, number of over-the-counter medications, number of symptoms, and number of diagnosed diseases. Adjusted 7 was the full model, adjusted for variables in previous model (Model 6) + physical function at baseline, cognitive function at baseline, and depression (Center for Epidemiologic Studies Depression [CES-D]) at baseline.

*Combined health measure of self-rated current overall health status and self-assessed future health.

SPPARCS = Study of Physical Performance and Age-Related Changes in Sonomans; CI = confidence interval; NA = not applicable.

Self-rated future health was also independently associated with mortality over the 10-year period (Table 3). Compared to participants who reported their future health as better/same, those who reported their future health as worse or unknown (“don’t know”) had an elevated mortality rate (RR worse/don’t know = 1.6, 95% CI, 1.3–2.0; $p = .00$) after adjustment for age, gender, and current health. After adjustment for all covariates (Model 7) and compared to participants who reported their future health as better/same, the effect of self-rated future health remained robust (RR worse/don’t know = 1.6, 95% CI, 1.2–2.1; $p = .01$).

Although assessments of both overall current and future health independently predicted subsequent mortality, the largest effect estimate was observed for the combined measure of current and future health. Compared to the referent (current health excellent/good and future health better/same), participants who reported their current health as excellent/good and their future health as worse/unknown had a greater mortality rate than those who reported current health as excellent/good and future health as better/same (Table 3, RR ranging from 1.6 to 2.0, compared to RR ranging from 1.2 to 1.5, respectively, depending on the number of covariates included in the model). Participants who reported the worst of the combinations (fair/poor current health and worse/unknown future health, compared to the referent), have the highest 10-year mortality RR in the cohort (Table 3, RR = 3.2, 95% CI, 2.2–4.7; $p = .00$) after adjustment for all covariates (Model 7).

DISCUSSION

Our findings provide new information about overall assessments of health and subsequent mortality in an aging population. We observed that a simple assessment of one’s own future health (1 year in the future) is independently predictive of mortality over a 10-year period. This relationship remains robust after adjustment for self-rated current overall health and other relevant covariates. We observed that the magnitude of the effect of self-rated future health on subsequent mortality is approximately the same as the effect on mortality of self-rated current health. Furthermore, the use of a combined measure of current and future health may be more useful in practice. For example, adding a question about self-rated future health in either an epidemiologic study or as part of a clinical health interview provides practitioners an opportunity to distinguish among people who report their current health as either fair or poor. Among older people who reported their current health as fair/poor, those who also reported that their future health would be better/the same next year had a lower mortality rate (adjusted RR = 1.7, compared to those reporting best of the combinations) than those who reported that their future health would be worse/unknown (adjusted RR = 3.2, compared to those reporting the best of the combinations).

As mentioned previously, self-rated current health is one of the most robust predictors of subsequent mortality. There is ongoing speculation about why the assessment of one’s current health is such a robust predictor of subsequent health, functional decline, and mortality (3–5). It may be that people predict their own future health as part of

a comprehensive assessment. However, if it were only that, then we would expect that a single assessment of overall health, either current or future, but not both, would be independently associated with subsequent mortality. In other words, the residual effect on mortality of one measure, either the current or future health, would subsume the effect of the other measure, when both variables are in the model. Furthermore, if assessments of one’s current and future health are based on overlapping underlying constructs, then the expected magnitude of the combined current and future health measures would have been approximately 1.6–1.8, similar to the effect of either measure mutually adjusted for the other. However, we observed a near-additive effect on 10-year mortality of the combined measure of current and future health for the worst combination (RR = 3.2, 95% CI, 2.2–4.7; $p = .00$), compared to the best combination. This observation suggests that all three health assessments are important in predicting subsequent mortality in an aging population: Self-rated current health and future health are equally important, and the combined measure of current and future health is useful in distinguishing among older adults who might experience the highest mortality rate.

Self-assessments of future health in older adults may be based on expectations of the future, for example, based on the type, severity, and treatment course for specific chronic conditions. This may include an appreciation of one’s own health or disease trajectory to date. If the person perceives that she or he is declining, she or he may simply expect that the downward trajectory will continue. These expectations for the future may be based in part on having previously witnessed the course of friends and family members with similar conditions. In contrast, assessments of one’s future health may be based on general feelings of optimism or pessimism about the future (16). In this case, subsequent mortality might not only be related to some form of individual self-monitoring of overall health and well-being but might also be related to one’s general world view (17). For example, common psychosocial variables that have been shown to be associated with subsequent risk of death, such as “self-efficacy” (18), a “sense of control” (18,19), a “sense of destiny” (19), a “sense of coherence” (20), and “dispositional optimism” (21) all seem to imply an expectation about the future (22,23). Self-efficacy (18) implies a level of self-confidence in one’s ability to achieve a particular goal. Sense of control or destiny (19) also implies the capacity to exert one’s control over future events. A sense of coherence, as defined by Antonovsky (20), is “a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one’s internal and external environments are predictable and that there is a high probability *that things will work out as well as can reasonably be expected*” (emphasis added). Finally, measures of “dispositional optimism” are intended to represent a general optimism about the future. People are asked to indicate whether they agree or disagree with statements such as “I often feel that life is full of promise” and “I still have positive expectations concerning my future” (22,24). Further conceptual work is necessary to examine whether self-ratings of future health overlaps with these underlying constructs.

Summary

Assessments of one's future health add an important and robust component of health and well-being that is independently associated with subsequent mortality in older adults. Furthermore, an overall health measure that combines self-rated current and future health might be most useful and valuable in practice settings in the identification of older adults with the highest mortality rate. The issue of whether reports of current health and of future health are based on similar or completely overlapping underlying constructs, as well as whether self-rated future health taps into such underlying constructs as "optimism" or "control of destiny," warrants further exploration.

ACKNOWLEDGMENTS

Dr. Wang thanks the Robert Wood Johnson Health & Society Scholars Program for its financial support. This research was also supported in part by a grant (AG09389) from the National Institutes of Health, National Institute on Aging.

We thank Professor S. Leonard Syme for helpful comments.

Both authors contributed equally to the study concept and design, data analysis design, and the interpretation of results. C. Wang carried out the data analysis. Both authors drafted and edited the manuscript and contributed equally to the development of the intellectual content. Both authors had full access to the data from the SPPARCS study and take full responsibility for the integrity of the data and the accuracy of the data analysis.

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Received December 7, 2006

Accepted March 30, 2007

Decision Editor: Luigi Ferrucci, MD, PhD