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Overall Cardiovascular Health Is Associated With All-Cause and Cardiovascular Disease Mortality Among Older Community-Dwelling Men and Women

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Abstract

Objective—The objective of this study was to assess the associations between cardiovascular health and all-cause and cardiovascular disease mortality among community-dwelling elderly.

Method—Secondary data analysis was performed using data collected as part of the InCHIANTI cohort procedures and included 928 participants (55% female) aged 65 years and older. Overall cardiovascular health was assessed using seven health behaviors and factors, scored 0 to 14, with higher scores indicating better cardiovascular health, modeled categorically as tertiles. Vitality status was ascertained using registry information. Cox proportional hazards models were used to examine the associations between cardiovascular health and all-cause and cardiovascular disease mortality.

Results—After an average follow-up of 9.1 years, better overall cardiovascular health (highest tertile) was inversely associated with all-cause (hazard ratio [HR] = 0.68, 95% confidence interval [CI] = [0.51, 0.92]) and cardiovascular disease mortality (HR = 0.61, 95% CI = [0.38, 0.97]) compared with the lowest tertile.

Discussion—Cardiovascular health, even in the elderly, is inversely associated with mortality.

Keywords

mortality; cardiovascular health; elderly; InCHIANTI study

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Research Ethics

All respondents signed informed consent, and the Italian National Institute of Research and Care on Aging Ethical Committee approved the study protocol. Furthermore, the institutional review board of George Washington University deemed this secondary analysis plan using de-identified data as not constituting human subjects research.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Introduction

The worldwide population of those aged 60 years and older has grown in the past few years and is projected to have a rapidly increasing trajectory for the high-income countries (Vincent & Velkoff, 2010; World Health Organization [WHO], National Institute on Aging, & National Institutes of Health, 2011). Some of the reasons for these increases in longevity have been attributed to a shift to chronic diseases from infectious diseases as the leading cause of death, alone and in combination with improved medical care (Rice & Fineman, 2004; WHO, National Institute on Aging, & National Institutes of Health, 2011). However, it is important to note that among the elderly, chronic diseases are a significant risk factor for declines in physical and cognitive functions (Bayliss, Bayliss, Ware, & Steiner, 2004; Carlo et al., 2000).

In addition to health factors such as high cholesterol, blood pressure, and blood glucose levels, health behaviors such as smoking, poor quality diet, and inadequate physical activity have been shown to be independent risk factors for chronic diseases and mortality (Burr et al., 1989; Chronic Disease Prevention and Health Promotion, 2014; Folsom et al., 1993; Hammond, 1966; Holme & Anderssen, 2015; Johnson, Hayes, Brown, Hoo, & Ethier, 2014; Landahl, Lernfelt, & Sundh, 1987; Prospective-Studies-Collaboration, 2007). Most studies have examined health factors and behaviors individually, and among the few that have used summary measures of either biomedical risk factors (cholesterol, blood pressure, diabetes) or health behaviors (smoking, physical activity, diet, obesity) showed reduced cardiovascular disease (CVD) mortality and all-cause mortality (Chakravarty et al., 2012; Fried et al., 1998; Lloyd-Jones, Dyer, Wang, Daviglus, & Greenland, 2007; Robinson et al., 2013; Stamler et al., 1999; Terry et al., 2005).

Because both health factors and health behaviors are important for reducing the risk for chronic diseases and mortality, in our study, we examined a cardiovascular health score assessing overall cardiovascular health based on American Heart Association's (AHA) Life's Simple 7, which includes health behaviors (smoking, body mass index [BMI], physical activity, and diet quality) and health factors (total cholesterol, blood pressure, and fasting plasma glucose; Lloyd-Jones et al., 2010). Specifically, we examined the association between cardiovascular health and all-cause and CVD mortality in a cohort of community-dwelling men and women 65 years and older. We hypothesized that in this elderly cohort, those with higher scores (indicating better cardiovascular health) at baseline would have lower risk of all-cause mortality and death due to CVD over a mean follow-up of 9 years.

Method

Data for these analyses were from the InCHIANTI study of aging. The InCHIANTI study is a prospective population-based study of elderly and includes participants from two cities: Greve in Chianti and Bagno a Ripoli in Tuscany, Italy. Participants were recruited during 1998 to 2000 using a two-stage stratified sampling procedure and were then followed longitudinally. Every 3 years, data on various study variables were collected through home interview, medical exam, and a clinical exam at the study site. A more detailed description of the InCHIANTI study has been provided elsewhere (Ferrucci et al., 2000).

A total of 1,453 participants enrolled at baseline, and out of these, 1,155 people with age greater than or equal to 65 years were included in these analyses. Participants ($n = 192$) who had missing information on any of the components of the cardiovascular health score or reported extreme energy intakes (defined as $> 4,000$ or < 600 kcal/day) were excluded. The incidence of all-cause death and CVD mortality was higher among participants with missing information on the cardiovascular health score. In addition, these participants were generally older, more likely to be cognitively impaired, and more likely to report disabilities on activities of daily living (ADL) and instrumental activities of daily living (IADL; data not shown). Furthermore, because some of the components of the overall cardiovascular health score such as diet, physical activity, and smoking status were based on self-report, which may be affected by cognitive status, we also excluded participants ($n = 35$) who had been diagnosed with dementia at baseline. The final analytical sample included 928 participants.

Overall Cardiovascular Health

Cardiovascular health in this cohort was based on criteria specified by the AHA and included seven health behaviors (smoking, diet quality, BMI, and physical activity) and factors (plasma total cholesterol, fasting glucose concentrations, and blood pressure). The detailed criteria for each cardiovascular health component are shown in the Appendix. We modified the criteria for three of the metrics, smoking, diet quality, and physical activity, to better suit the study population and data availability for the cohort. Smoking, in this study, was classified as *never smoking*, *former smoker*, and *current smoking* (within 3 years). Physical activity was classified as *inactive* (inactive, or with some walking), *light active* (light exercise 2–4 hr/week), and *active* (light exercise for more than 4 hr/week, moderate exercise for at least 1–2 hr/week, or intense exercise many times/week). For diet quality, we examined adherence to a Mediterranean-style diet. The Mediterranean diet score assessed intakes of nine foods, food groups, and nutrients. For food groups and nutrients that were considered beneficial, including vegetables, legumes, fruits and nuts, cereal, fish, and monounsaturated- to-saturated fatty acid ratio, participants received a point of 1 if their intakes were above the sex-specific median. For detrimental food groups (meat, dairy products), participants received 1 point if their intake was below the sex-specific median. For alcohol intake, participants received 1 point if they consumed between 10 g/day and 50 g/day for men and between 5 g/day and 25 g/day for women. A point of 0 would be given otherwise (Trichopoulou, Costacou, Bamia, & Trichopoulos, 2003).

In the cohort, information on smoking status and physical activity was obtained during home interview using standard questionnaires. Weight and height of each participant was measured, and BMI was then calculated as Weight (in kilograms) divided by the square of Height (in meters). A previously validated Food Frequency Questionnaire, which was created for the European Prospective Investigation Into Cancer and Nutrition (EPIC), was used to assess participants' dietary intake (Pisani et al., 1997). Standard mercury sphygmomanometer was used to measure blood pressure 3 times, 2 min apart while participants were in supine position. Blood pressure was first measured on both arms, and two following measures were conducted on the arm of having higher systolic blood pressure at the first measure. The average of the last two measures was calculated as the final blood pressure of each participant. Total cholesterol and fasting plasma glucose were measured

through blood test. Blood samples were collected after at least 8 hr fasting. An enzymatic colorimetric assay using a modified glucose oxidase-peroxidase method and a Roche-Hitachi 917 analyzer (Roche Diagnostics, GmbH, Mannheim, Germany) were used to determine fasting plasma glucose, and total cholesterol was determined by commercial enzymatic tests (Roche Diagnostics). Medication uses for reducing blood pressure, total cholesterol, and plasma glucose were also reported.

Participants were assigned 0 (*poor*), 1 (*intermediate*), or 2 (*ideal*) points based on their status for each of the cardiovascular health components (Appendix). For further analyses, we used the tertiles of the overall cardiovascular health score. For the InCHIANTI participants, the overall cardiovascular score for first, second, and third tertiles ranged from 0 to 6, 7 to 8, and 9 to 12, respectively. Cardiovascular health behaviors (score range: 0–8) and factors (score range: 0–6) were also separately examined.

Mortality—All-Cause and CVD-Specific

As part of cohort procedures, every study participant was contacted for follow-up interviews approximately every 3 years. After ascertaining vitality status, reports on mortality were confirmed using data from Tuscany Region Mortality General Registry and death certificates at the registry office of the municipality of residence. The mortality was recorded from 1998 to 2010. International Classification of Diseases, Ninth Revision (ICD-9) was used for identifying the underlying cause of death. Death due to heart diseases (ICD-9 code: 390-398, 402, 410-429, 440), stroke (ICD-9 code: 430-438), or other CVD (ICD-9 code: 441-448) was classified as CVD death for analyses purposes.

Covariates

The selection of covariates in these analyses was informed by univariate analyses and previously published literature and included age, sex, education, ADL disability, IADL disability, presence of chronic diseases, and impaired cognition. Education was assessed by querying participants' total years of schooling. The ADL and IADL disabilities indicated the number of basic and instrumental activities of daily living which participants were not able to perform independently at baseline, and the number ranged from 0 to 6 for ADL and 0 to 8 for IADL (Lawton & Brody, 1969). Chronic diseases, including cancer, heart failure, coronary heart disease, stroke, chronic lung disease, hip arthritis, liver disease, gastrointestinal disease, peripheral arterial disease, Parkinson's disease, and renal disease, was operationalized as the presence (or absence) of any of these specified diseases. The Mini Mental State Examination (MMSE) was used to assess impaired cognition at baseline. The MMSE score ranged from 0 to 30, and the cutoff score of 24 was used such that participants with an MMSE score below 24 were classified as having impaired cognition (Dick et al., 1984).

Statistical Analyses

Baseline sociodemographic and health characteristics were reported as means (standard deviation [*SD*]) or percentage, and one-way ANOVA for continuous variables and chi-square tests for categorical variables were used to test the difference of variables across the tertiles of overall cardiovascular health score. The incidence of death was calculated per 1,000

person-years. The association between overall cardiovascular health and all-cause and CVD mortality after adjusting for age, sex, education, ADL, IADL, impaired cognition, and chronic diseases were examined through Cox proportional hazards model, and hazard ratios (HRs) and their 95% confidence intervals (CIs) were reported. The proportional hazards assumption was ensured by examining the log–log plot and Schoenfeld residuals test. The non-linear models were also tested by including quadratic term for age, and this term was statistically significant in the CVD mortality model; hence, it was included in the model. We also checked for effect modification by sex, presence of chronic diseases, impaired cognition, ADL, and IADL, and because none of these terms were statistically significant, they were dropped from the final model. We also examined the associations between mortality and cardiovascular health behaviors and factors separately using Cox proportional hazards models, adjusting for all covariates. All analyses were performed using Stata Version 13.1 (StataCorp, 2013), and a p value less than .05 was considered to be statistically significant.

Results

The baseline sociodemographic and health characteristics are described in Table 1. The mean age (SD) of the cohort was 74 (6.67) years, with 55% being women. Participants with a higher overall cardiovascular health score at baseline were younger ($p = .06$) and reported less difficulties for ADL ($p = .016$) and IADL ($p < .001$). The distribution of ideal, intermediate, and poor scores for each component of the overall cardiovascular health score are presented in Figure 1. In this cohort of older individuals, 58.4% had ideal scores for smoking status, 39.1% for physical activity, 28.8% for BMI, 28.9% for diet quality, 29.2% for total cholesterol, 2.4% for blood pressure, and 73.5% for fasting plasma glucose.

The average follow-up for the cohort was 9.1 years (range: 0.2–11.4 years). By 2010, a total of 301 people died (incidence rate = 35.7 per 1,000 person-years). The incidence of all-cause and CVD mortality was the highest for participants in the first tertile (lowest overall cardiovascular health score; Table 2). Compared with participants in first tertile, the risk of all-cause mortality were significantly lower for participants in the second tertile ($HR = 0.67$, $p = .004$, 95% $CI = [0.52, 0.88]$) and third tertile ($HR = 0.68$, $p = .012$, 95% $CI = [0.51, 0.92]$) after adjusting for sex, age, education, impaired cognition, presence of chronic diseases, ADL, and IADL. There were no statistically significant differences between the second and third tertiles. Protective associations for overall cardiovascular health were observed when the score was examined on a continuous scale, wherein a one unit increase in the score was associated with a 9% lower risk of all-cause mortality ($HR = 0.91$, $p = .001$, 95% $CI = [0.86, 0.96]$; Table 3).

Forty percent of deaths in the cohort were due to CVD ($n = 119$, incidence rate = 14.1 per 1,000 person-years). Similar to that observed for all-cause mortality, a one unit increase in the overall cardiovascular health score was associated with an 11% lower risk of CVD-related mortality ($HR = 0.89$, $p = .010$, 95% $CI = [0.81, 0.97]$). When tertiles of overall cardiovascular health scores were examined, participants with scores in the second tertile ($HR = 0.62$, $p = .033$, 95% $CI = [0.41, 0.96]$) and third tertile ($HR = 0.61$, $p = .037$, 95% $CI = [0.38, 0.97]$) had significantly lower risk of CVD-related mortality as compared with those

in the first tertile. There were no statistically significant differences between participants in the second and third tertiles for CVD mortality.

In sensitivity analysis, we excluded participants who died within 2 years from baseline information collection and then re-ran the analyses for the associations between mortality and cardiovascular health score. The cardiovascular health score was still significantly associated with both all-cause and CVD mortality and demonstrated an even higher risk of mortality for participants with poor cardiovascular health (data not shown).

Summary scores for health behaviors and factors were also associated with reduced risk of all-cause and CVD mortality after adjusting for all covariates (Table 4). For every 1 unit increase in the health behavior score, participants had a 14% lower risk of all-cause mortality (HR = 0.86, $p < .001$, 95% CI = [0.79, 0.93]) and a 12% lower risk of CVD mortality (HR = 0.88, $p = .05$, 95% CI = [0.77, 1.00]), whereas for every 1 unit increase in the health factor score, participants had a 14% lower risk of CVD mortality (HR = 0.86, $p = .038$, 95% CI = [0.74, 0.99]). Associations for the health factor score with all-cause mortality were not statistically significant.

The Kaplan–Meier survival curve also showed a higher survival rate for people in the highest tertile over 11 follow-up years (Figure 2). The mean (*SD*) survival time for participants in the first tertile was 8.9 (0.19) years, for second tertile it was 9.4 (0.15) years, and for third tertile, it was 9.6 (0.16) years.

Discussion

The goal of this study was to examine whether overall cardiovascular health was associated with mortality among older individuals. Overall cardiovascular health in this study was assessed using a summary measure of four health behaviors and three health factors. Our results indicate that higher scores for overall cardiovascular health (indicating better cardiovascular health) were associated with lower all-cause and CVD-related mortality, suggesting that health behaviors (smoking, physical activity, BMI, diet quality) and factors (total cholesterol, blood pressure, plasma glucose) are important for older individuals in improving life expectancy. Protective associations were also found for summary measures of only the health behaviors (all-cause and CVD mortality) and health factors (CVD mortality only).

The overall cardiovascular health score, based on the AHA's Life's Simple 7 metric, assessed smoking status, physical activity, BMI, diet quality, levels of total cholesterol and fasting blood glucose, and measures of blood pressure, all of which are important for CVD prevention and enhancing disease-free life (Lloyd-Jones et al., 2010). Several studies have demonstrated a protective association for higher scores for this summary measure with CVD, including stroke and coronary heart disease (Folsom et al., 2011; Kulshreshtha et al., 2013). And evidence for protective associations have also been reported for other health conditions including chronic kidney disease, venous thromboembolism, subclinical atherosclerosis, inflammation, cognitive decline, and depression (Kronish, Carson, Davidson, Muntner, & Safford, 2012; Muntner et al., 2013; Olson et al., 2015; Thacker et

al., 2014; Xanthakis et al., 2014) It is important to note that most of these studies have examined the role of cardiovascular health in young and middle-aged adults, and there are few investigations that have focused on older populations.

Our study demonstrated that overall cardiovascular health, even in older individuals, is protective against all-cause and CVD mortality. The HRs for these associations in this cohort of older adults were similar to those that have been reported in other studies with younger and middle-aged participants (Artero et al., 2012; Ford, Greenlund, & Hong, 2012; Yang et al., 2012). Moreover, distributions of the individual components observed in the present study, including the low number of participants receiving ideal scores for all the health factors and behaviors, are similar to those reported by others (Ford et al., 2012; Yang et al., 2012). One notable difference in this cohort as compared with other studies was the high prevalence of those classified as poor health for the blood pressure criteria. In our cohort, 78% of participants were classified as having either systolic blood pressure equal to or above 140 mmHg or diastolic blood pressure equal to or above 90 mmHg, and participants with blood pressure above 120/80 mmHg had higher risk of death. High prevalence of hypertension has also been reported by other epidemiological investigation in the elderly, suggesting that high blood pressure is a major risk for older adults (Hajjar & Kotchen, 2003; Vokonas, Kannel, & Cupples, 1988).

Our study had several strengths including its prospective design and focus on older individuals. In addition, data on health behaviors and factors were collected using standardized and validated methods. Mortality was also verified by local Mortality General Registry. Information on several confounders and covariates, including cognitive and physical function status and comorbidities, was available in the cohort, and we were able to adjust for these in the analyses. Some limitations include its observational design which could lead to some residual confounding. Our study cohort consisted of 928 older men and women, which is a relatively small sample size; however, it must be noted that post hoc analyses indicated that we were 80% powered to detect a HR of 0.72, assuming two-sided testing at the .05 level. Although not a limitation, we modified the overall cardiovascular health score for diet quality and physical activity from those specified by the AHA for their Life's Simple 7 metric. Given the age range of the study participants and the previous work that had been published using the physical activity data in the InCHIANTI cohort, we opted to use similar scoring criteria for the cohort (Elosua et al., 2005). Similarly, we used adherence to a Mediterranean-style diet as the diet quality metric, as it better reflected the dietary patterns of the region and had previously been shown to be associated with age-related declines in the cohort (Milaneschi et al., 2011; Talegawkar et al., 2012). Out of the cohort eligible for these analyses, 16.5% had missing data for one or more components of the cardiovascular health score. The incidence of all-cause death and CVD mortality was higher among participants with missing information for the cardiovascular health score. These participants were generally older, had cognitive impairment, and were more likely to report disabilities on ADL/IADL. Given this, the associations obtained in our analyses may be a conservative estimate of the true associations between cardiovascular health and mortality.

In conclusion, even among older individuals, better overall cardiovascular health assessed by health behaviors (smoking, physical activity, BMI, diet) and health factors (cholesterol, blood pressure, plasma glucose) was associated with a lower risk of all-cause mortality and CVD mortality. These relationships allude to the importance of emphasizing health factors and behaviors in the elderly in promoting longevity.

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Appendix

Criteria of Each of the Overall Cardiovascular Health Component.

Overall cardiovascular health components	Ideal (2 points)	Intermediate (1 point)	Poor (0 point)
Smoking	Non-smoker	Former smoker	Current smoker within 3 y
Physical activity	Light exercise for more than 4 hr/week, moderate exercise for at least 1–2 hr/week, or intense exercise many times/week	Light exercise 2–4 hr/week	Inactive, or with some walking
Body mass index (kg/m ²)	<25	25–29.9	30
Diet quality (Mediterranean diet score)	6–9	4–5	0–3
Total cholesterol (mg/dl)	<200	200–239 or treated to <200	240
Blood pressure (mmHg)	SBP < 120 and DBP < 80	SBP: 120–139 or DBP: 80–89 or treated to SBP < 120 and DBP < 80	SBP 140 or DBP 90
Fasting plasma glucose (mg/dl)	<100	100–125 or treated to <100	126

Note. SBP = systolic blood pressure; DBP = diastolic blood pressure.

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Figure 1.

Percentage of ideal, intermediate, and poor for each component of overall cardiovascular health assessment among InCHIANTI participants aged 65 years and older.

Note. BMI = body mass index.

Figure 2.
All-cause mortality Kaplan–Meier survival estimates during 11-year follow-up among InCHIANTI participants aged 65 years and older.

Table 1

Baseline Sociodemographic and Health Characteristics (mean [standard deviation] or percentage) by the Tertiles of Overall Cardiovascular Health Score Among InCHIANTI Participants Aged 65 Years and Older.

Variables	Total	Overall cardiovascular health score			p value
		1st tertile Score = 0–6	2nd tertile Score = 7–8	3rd tertile Score = 9–12	
<i>n</i>	928	250	376	302	
Overall cardiovascular health score	7.58 (1.91)	5.19 (1.08)	7.49 (0.50)	9.69 (0.87)	
Female (%)	55.2	55.6	58.0	51.3	.221
Age (years)	74.0 (6.67)	74.6 (6.85)	74.2 (6.54)	73.3 (6.64)	.06
Education (years)	5.51 (3.24)	5.48 (3.30)	5.48 (3.10)	5.57 (3.36)	.924
MMSE score	25.4 (3.07)	25.3 (2.90)	25.4 (3.08)	25.6 (3.20)	.472
Presence of ADL disabilities (%)	3.99	5.20	5.32	1.32	.016
Presence of IADL disabilities (%)	19.5	27.2	21.0	11.3	<.001
Presence of chronic disease (%)	62.2	68.0	62.8	56.6	.022
BMI (kg/m ²)	27.5 (4.06)	29.6 (4.30)	27.5 (3.89)	25.8 (3.19)	<.001
Mediterranean diet score	4.47 (1.64)	3.72 (1.63)	4.40 (1.55)	5.18 (1.44)	<.001
Total cholesterol (mg/dl)	219 (38.7)	235 (39.0)	221 (35.1)	203 (36.9)	<.001
Systolic blood pressure (mmHg)	151 (19.5)	155 (17.0)	153 (19.0)	145 (20.8)	<.001
Diastolic blood pressure (mmHg)	84.1 (8.55)	85.6 (7.71)	84.7 (8.39)	82.2 (9.07)	<.001
Fasting plasma glucose (mg/dl)	96.0 (26.3)	110 (33.4)	93.6 (25.4)	87.5 (12.6)	<.001
Physical activity (%)					<.001
Sedentary	16.8	35.6	15.2	3.31	
Light active	44.1	50.8	51.1	29.8	
Active	39.1	13.6	33.8	66.9	

Note. MMSE = Mini Mental State Examination; ADL = activities of daily living; IADL = instrumental activities of daily living; BMI = body mass index.

Table 2

Incidence Rate of All-Cause Mortality and CVD Mortality Among InCHIANTI Participants Aged 65 Years and Older.

	All-cause mortality		CVD mortality	
	Death (<i>n</i>)	Incidence rate^a	Death (<i>n</i>)	Incidence rate^a
Cardiovascular health score				
1st tertile	108	49.3	48	21.9
2nd tertile	113	32.8	45	13.1
3rd tertile	80	28.5	26	9.3
Total	301	35.7	119	14.1

Note. CVD = cardiovascular disease.

^aIncidence rate per 1,000 person-years..

Adjusted Hazard Ratio of All-Cause Mortality and CVD Mortality for Overall Cardiovascular Health Score Among InCHIANTI Participants Aged 65 Years and Older.^a

Table 3

	All-cause mortality			CVD mortality		
	Hazard ratio	<i>p</i> value	95% CI	Hazard ratio	<i>P</i> value	95% CI
Cardiovascular health score ^b						
Per 1 point increase	0.91	.001	[0.86, 0.96]	0.89	.01	[0.81, 0.97]
1st tertile	Ref.			Ref.		
2nd tertile	0.67	.004	[0.52, 0.88]	0.62	.033	[0.41, 0.96]
3rd tertile	0.68	.012	[0.51, 0.92]	0.61	.037	[0.38, 0.97]
Covariates ^c						
Aged	1.12	<.001	[1.10, 1.14]	2.68	.003	[1.40, 5.16]
Female	0.49	<.002	[0.39, 0.63]	0.48	<.001	[0.33, 0.70]
Education years ^d	0.98	.338	[0.94, 1.02]	0.98	.573	[0.92, 1.05]
ADL disability ^e	1.20	.034	[1.01, 1.42]	1.17	.197	[0.92, 1.49]
IADL disability ^e	1.18	<.001	[1.09, 1.28]	1.34	<.001	[1.20, 1.50]
Cognitive impairment	1.07	.652	[0.80, 1.44]	1.09	.702	[0.71, 1.68]
Chronic disease	1.66	.001	[1.24, 2.21]	1.53	.107	[0.91, 2.55]

Note. CI = confidence interval; ADL = activities of daily living; IADL = instrumental activities of daily living; CVD = cardiovascular disease.

^aCox proportional hazard model adjusted for age (years), sex, education (years), impaired cognition (Mini Mental State Examination, [MMSE] score < 24), number of ADL disabilities, number of IADL disabilities, presence of chronic diseases (Y/N), and quadratic term for age for the model of CVD mortality.

^bThere were no statistically significant differences between the second and third tertiles, for both, all-cause and CVD mortality.

^cCovariates in the Cox proportional hazard model are for cardiovascular health score modeled as tertiles.

^dPer 1 year increase.

^ePer 1 ADL and IADL disability increase, respectively.

Table 4

Adjusted Hazard Ratio of All-Cause Mortality and CVD Mortality for Cardiovascular Health Behaviors and Factors Among InCHIANTI Participants Aged 65 Years and Older.^a

	Hazard ratio	<i>p</i> value	95% CI
All-cause mortality			
Health behaviors ^b	0.86	<.001	[0.79, 0.93]
Health factors ^c	0.95	.286	[0.85, 1.05]
CVD mortality			
Health behaviors ^b	0.88	.05	[0.77, 1.00]
Health factors ^c	0.86	.038	[0.74, 0.99]

Note. CI = confidence interval; CVD = cardiovascular disease; ADL = activities of daily living; IADL = instrumental activities of daily living; BMI = body mass index.

^aCox proportional hazard model adjusted for age (years), sex, education (years), impaired cognition (Mini Mental State Examination, [MMSE] score < 24), number of ADL disabilities, number of IADL disabilities, presence of chronic diseases (Y/N), and quadratic term for age for the model for CVD mortality.

^bHealth behaviors included smoking, physical activity, BMI, diet quality, and score ranged from 0 to 8. Hazard of mortality per 1 point increase of health behavior score.

^cHealth factors included blood pressure, total cholesterol, fasting plasma glucose, and score ranged from 0 to 6. Hazard of mortality per 1 point increase of health factor score.