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Cardiovascular Health Is Associated With Disability Among Older Community Dwelling Men and Women

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Abstract

Objective: The aim of this study was to investigate whether an index of overall cardiovascular health (CVH) is associated with disability in older individuals.

Method: Data on 925 participants of the InCHIANTI study (Invecchiare in Chianti, aging in the Chianti area, 65 years, 55% women) with median follow-up of 9 years were used. CVH score was assessed by smoking status, physical activity, body mass index, diet quality, blood pressure, plasma cholesterol, and fasting blood glucose. Disability was examined using instrumental activities of daily living (IADL disabilities >0 vs. 0) and activities of daily living (ADL disabilities >0 vs. 0). Generalized estimating equations and Cox models assessed relationships between baseline CVH with disability and worsening over 9 years.

Results: A 1-point increase in the CVH score was associated with 23% and 17% of lower odds of ADL ($p < .001$) and IADL ($p < .001$) disability and was protective of worsening of disability over 9 years. Cox models demonstrated that a 1-point increase in CVH score was associated with lower hazards of both ADL (hazard ratio [HR] = 0.86, $p = .005$) and IADL (HR = 0.91, $p = .007$) disability.

Discussion: Among older individuals, better CVH was associated with lower risk of disability and worsening over 9 years.

Keywords

InCHIANTI study of aging; ADL; IADL; worsening disability

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Declaration of Conflicting Interests

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Introduction

It is projected that by 2030, the worldwide population of individuals 65 years and older will have increased from 550 to 973 million (U.S. Census Bureau, 2015; Vincent & Velkoff, 2010). As life expectancy increases, the quality of life is a significant public health concern with disability in late-life becoming a pressing public health issue. Population aging is currently at the center of public policy debate because of its potential for significantly impacting health care expenditures of countries. Economists believe that while aging is an important contributor to these expenses, several factors either directly impact or interact with population aging to impact these (United Nations Department of Economic and Social Affairs, Population Division, 2015). One such factor is disability, more commonly associated with chronic diseases such as cardiovascular disease (CVD), cancer, and dementia, which is more prevalent in older individuals (Millán-Calenti et al., 2010), resulting in increased health care costs associated with hospitalization or long-term care (Crimmins, 2004). Therefore, investigation of the factors associated with disability among elderly is important for formulating public health strategies to improve physical function and maintain physical well-being in late-life.

Cardiovascular health (CVH) is a concept that was proposed and defined by the American Heart Association (AHA) in 2010 to identify factors that together were associated with a lower risk of CVD and stroke, and the Life's Simple 7 (LS7), a metric that includes seven health behaviors and factors, including smoking status, physical activity, body mass index (BMI), diet quality, blood pressure, total cholesterol, and fasting plasma glucose, has been used to assess CVH (Lloyd-Jones et al., 2010). Studies have shown that higher overall scores for this metric and its components, indicating better CVH, are associated with a lower risk of chronic disease, age-related declines in physical and cognitive functioning, and mortality (Folsom et al., 2011; Jin, Tanaka, Bandinelli, Ferrucci, & Talegawkar, 2016; Jin et al., 2017; Rebholz et al., 2016; Talegawkar, Jin, Kandula, & Kanaya, 2017; Thacker et al., 2014). Two cross-sectional studies have examined associations between CVH and disability. Using nationally representative data from non-institutionalized individuals 20 years and older from the National Health and Nutrition Examination Survey (NHANES) from 2005 to 2012, a 1-point increase in the number of CVH metrics within an ideal level was associated with a 16% reduction in the odds of disability (Devulapalli, Shoirah, & Dhamoon, 2016), and using data from the Chilean National Health Survey 2009–2010, 65 years and older individuals with five to seven ideal metrics had 49% lower odds of disability compared with those with zero to two ideal metrics (García-Hermoso, Ramírez-Vélez, Ramirez-Campillo, & Izquierdo, 2017). In addition, in a longitudinal cohort of middle aged and older men and women belonging to the Northern Manhattan Study, after a follow-up of 13 years, participants with at least five of the metrics in the ideal range had 45% lower odds of disability compared with those with less than two of the metrics (Dhamoon, Dong, Elkind, & Sacco, 2015). While these investigations have examined the associations between CVH and disability, there are no studies that we are aware of examining the longitudinal role of CVH assessed using the LS7 metric and progression of disability among older individuals.

Therefore, in these analyses, we examined the associations between CVH, assessed at baseline, and the odds for and worsening of disability assessed using activities of daily living

(ADL) and instrumental activities of daily living (IADL) in a cohort of community dwelling men and women 65 years and older over a 9-year follow-up. We hypothesized that a higher score, indicating better CVH, would be associated with lower odds of disability and its worsening.

Method

We used data from the InCHIANTI cohort, a longitudinal study of mostly older individuals randomly selected using a two-stage stratified sampling procedure from two cities, Greve in Chianti and Bagno a Ripoli, in Tuscany, Italy, in 1998–2000 with 1,453 participants recruited. The detailed description of the InCHIANTI study procedures has been provided elsewhere (Ferrucci et al., 2000). All respondents signed informed consent, and the Italian National Institute of Research and Care on Aging Ethical Committee approved the study protocol.

For these analyses, we excluded participants less than 65 years of age ($n = 287$), those diagnosed with dementia ($n = 82$), those with implausible daily energy intakes (defined as below 600 kcal/d or above 4,000 kcal/d, $n = 14$), those with a BMI of less than 18.5 kg/m² ($n = 4$), and those missing components of CVH ($n = 141$). The final analytical sample included 925 participants at baseline, and 788, 715, and 597 participants with available ADL and IADL at 3-year (2001–2003), 6-year (2004–2006), and 9-year (2007–2009) follow-ups, respectively.

ADL and IADL Disability

In the InCHIANTI cohort, disability status was assessed as part of cohort procedures at baseline and each follow-up visit, and was operationalized using assessments of ADL and IADL (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Lawton & Brody, 1969). The ADL questionnaire includes six functional tasks: bathing, dressing, toileting, getting into and out of bed, continence, and eating. While the IADL includes eight daily tasks: using the telephone, shopping, food preparation, light housework, laundering, transportation, taking medications, and handling finances. The number of ADL and IADL disabilities was defined as the number of these daily tasks that participants were unable to accomplish, and the number of ADL and IADL disabilities greater than 0 was considered as having disability.

Worsening of ADL and IADL disability at each follow-up was defined as increase in the number of ADL and IADL disability at follow-up from baseline and treated as dichotomous outcome compared with no change or decrease in the number of reported ADL and IADL disability.

Overall CVH Score

CVH was assessed by seven health behaviors and factors including smoking status, physical activity, BMI, diet quality, blood pressure, total cholesterol, and fasting plasma glucose, and a score of 0 (*poor*), 1 (*intermediate*), or 2 (*ideal*) was assigned to participants for each component based on their status according to AHA LS7 criteria (Lloyd-Jones et al., 2010). This results in a score ranging from 0 to 14, with 14 having perfect CVH.

We modified the criteria for smoking status and physical activity based on data available for the cohort. According to the LS7 criteria, smoking status is classified as never or quit > 12 months, former (quit ≤ 12 months), and current smoker, and physical activity is defined as none, 1 to 149 min/week moderate, or 1 to 74 min/week vigorous, or 1 to 149 min/week moderate + vigorous activity, and ≥ 150 min/week moderate, or ≥ 75 min/week vigorous or ≥ 50 min/week moderate + vigorous activity. In this study, smoking status was classified as never, former, and current smoking within 3 years. For physical activity, participants who were inactive or having some walking were classified as inactive; those who had light exercise for 2 to 4 hr/week were classified as light active; and those with light exercise for more than 4 hr/week, moderate exercise for at least 1 to 2 hr/week, or intense exercise many times/week were classified as active. The data for smoking status and physical activity were collected at the home interview using standard questionnaires.

A validated food frequency questionnaire (FFQ) previously developed for the Italy site of European Prospective Investigation on Cancer and Nutrition investigations was used to assess self-reported dietary intakes (Bartali et al., 2004; Pisani et al., 1997). We operationalized diet quality by examining adherence to a Mediterranean-style diet that is more consistent with the dietary pattern in the geographical region where participants resided. The Mediterranean diet score (ranged from 0 to 9) was calculated by assessing the intakes of nine food groups and nutrients, and 1 point was assigned for each beneficial dietary item including vegetables, legumes, fruits and nuts, cereal, fish, monounsaturated-to-saturated fatty acid ratio if intake was greater than the sex-specific median, and for meat and dairy intakes if less than sex-specific median (considered detrimental), and moderate intake of alcohol (Trichopoulou, Costacou, Bamia, & Trichopoulos, 2003).

Weight (in kg) and height (in m) and blood pressure were measured at study clinic. BMI (in kg/m²) was calculated as weight divided by the square of height. Blood pressure was measured thrice, 2 min apart in supine position using standard mercury sphygmomanometer. The last two measures were conducted on the arm with the higher systolic blood pressure at the first measure, and the average value of the last two measures was used for analyses. Information on medication use was collected through home interview (Ferrucci et al., 2000).

Total cholesterol and plasma glucose were measured through blood tests. Blood samples were collected after participants had fasted at least 8 hr. Total cholesterol was measured using commercial enzymatic tests (Roche Diagnostics), and fasting plasma glucose was measured by an enzymatic colorimetric assay using a modified glucose oxidase-peroxidase method and a Roche-Hitachi 917 analyzer (Roche Diagnostics, GmbH, Mannheim, Germany).

The detailed information on scoring criteria was summarized in Supplementary Table 1. The overall CVH score was calculated by summing individual score of each CVH component. In this cohort, the overall CVH score ranged from 0 to 12 because no one received ideal level score for all components. We have previously established the associations between this CVH score and mortality and physical function which showed consistent results with other literatures (Jin et al., 2016; Jin et al., 2017).

Covariates

Covariates were selected based on univariate analyses and previously published literature on disability, and included age (years), sex, education (years, only for IADL), presence of chronic diseases (number), impaired cognition, and depression. 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, were assessed based on the criteria used in the Women's Health and Aging Study (Guralnik, Fried, Simonsick, Kasper, & Lafferty, 1995). Mini-Mental State Examination (MMSE) was used to assess cognitive status, and a score less than 24 was defined as having impaired cognition (Dick et al., 1984). Depression was identified as having score of at least 16 on the Center for Epidemiological Studies–Depression (CES-D) scale (Milaneschi et al., 2011).

Statistical Analysis

The baseline CVH score was categorized into tertiles with scores ranging from 0 to 6, 7 to 8, and 9 to 12 for first, second, and third tertile, respectively. Baseline sociodemographic characteristics were reported as mean $\pm$ standard deviation, percentage, or median (interquartile range). ANCOVA, chi-square, or Kruskal–Wallis tests were used to examine differences of baseline sociodemographic characteristics across CVH score tertiles. CVH score was analyzed on both continuous scale and tertiles. We used generalized estimating equations (GEE) models with unstructured correlation to assess the relationship between baseline CVH with ADL and IADL disability over a 9-year follow-up, after adjusting for baseline covariates. We also examined the associations between worsening of ADL and IADL disability with CVH score using GEE models. Cox proportional hazards regression models were used to estimate associations between baseline CVH with time to incidence of ADL and IADL disability in participants without reported disability at baseline after testing for the assumption of proportionality of the hazard ratios. The percent change of the number of ADL and IADL disability, adjusting for baseline status, at each follow-up from baseline was also calculated and assessed across CVH score tertiles. All covariates and time variable were examined for effect modification; however, these were not significant. Due to the effect of stroke, heart failure, and cancer on disability status, we conducted sensitivity analysis on the association between CVH with ADL and IADL disability with GEE models after excluding participants who reported these at baseline. Also, another sensitivity analysis was conducted to assess associations between CVH and disability and its worsening after excluding participants with disability at baseline as individuals with disability have less physical activity which could lead to reverse causation. In supplementary analyses, CVH components were classified as health behaviors (smoking status, physical activity, BMI, and diet quality) and health factors (blood pressure, total cholesterol, and plasma fasting glucose), and the longitudinal associations between scores of health behaviors (ranged from 0 to 8) and health factors (ranged from 0 to 6) with ADL and IADL disability worsening were also examined using GEE models. Stata version 13 (StataCorp., 2013) was used to perform all the analyses, and a p value $< .05$ considered to be statistically significant.

Results

Socio-demographic and health characteristics of the cohort at baseline are shown in Table 1. About 55% of participants were women with a mean age of 74 years. Participants with higher CVH scores had lower number of chronic diseases ($p < .001$), and did not report ADL ($p = .016$) and IADL ($p < .001$) disabilities. Four percent of participants had at least one ADL disability at baseline, while 19% reported at least one IADL disability.

Adjusted longitudinal associations between CVH scores with ADL and IADL disability over a 9-year follow-up are presented in Table 2. Among all participants, for ADL, a 1-point increase in the CVH score was associated with 23% lower odds of ADL disability ($p < .001$); similarly, compared with those in lowest tertile of CVH, those in the second and third tertiles of CVH score had 40% ($p = .019$) and 67% ($p < .001$) lower odds of ADL disability over a 9-year period, respectively. Similar protective associations were observed between CVH and IADL disability among all participants. In sensitivity analysis, after excluding participants with disability at baseline, higher CVH scores were still significantly associated with lower odds of ADL ($p = .002$) and IADL ($p < .001$) disability. We repeated these analyses excluding participants with stroke, heart failure, and cancer at baseline, and while associations remained, they were attenuated especially for the ADL disability outcome (data not shown).

The odds of worsening ADL disability were lowered by 19% per 1-point increase of baseline CVH score, while this for IADL disability was 16% lower over a 9-year follow-up among all participants (Table 3). Similar protective associations were also seen for participants who were free of disability at baseline.

Among participants without disability at baseline (Table 4), 1-point increase in the CVH score was associated with 14% lower hazard of ADL disability ($p = .005$) and 9% lower hazard of IADL disability ($p = .007$). Protective associations were observed for CVH modeled as tertiles, while associations with IADL were weaker.

In the adjusted longitudinal analysis between health behaviors and factors and disability outcomes, health behaviors were found to be associated with 29% lower odds of ADL ($p < .001$) and 28% lower odds of IADL ($p < .001$) disability, as well as decreased risk of worsening ADL ($p < .001$) and IADL ($p < .001$) disability (Supplementary Tables 2 and 3). No significant associations were seen between health factor scores and disability.

Discussion

In this cohort of older men and women, better baseline CVH scores, assessed using four health behaviors (smoking status, physical activity, BMI, and diet quality) and three health factors (blood pressure, total cholesterol, and fasting plasma glucose), were associated with lower risk of ADL and IADL disability over a 9-year follow-up. In addition, participants with better CVH also had slower worsening of ADL and IADL disability. CVH was examined both as a continuous and categorical factor, and the results indicate that the reduced risk of disability was linear with incremental protection observed with higher scores of CVH.

Consistent with prior studies (Devulapalli et al., 2016; Dhamoon et al., 2015; García-Hermoso et al., 2017), the current study confirms that higher CVH score is incrementally associated with lower risk of ADL disability over the 9-year follow-up period. Higher CVH was also inversely associated with the risk of IADL disability which may identify incipient declines in physical and cognitive functioning, and this study is the first to show that this protection is also observed longitudinally in older population. Furthermore, this is the first longitudinal study to show that CVH, based on AHA guidelines, is a valid and powerful predictor of disability in non-American population. This would suggest that CVH index is a useful tool to assess health worldwide.

This study also showed slightly attenuated associations for participants with no disability at baseline compared with all participants, indicating potential reverse causality, so disabled participants at baseline tend to have a more sedentary lifestyle, and the physical activity of the component of the metric may be associated with disability. While this may be true, disability is a complex phenomenon and involves interactions between the biology or impairments in body functions and structures and contextual factors such as the environment leading to restriction in participation in activities eventually resulting in disability (Schneidert, Hurst, Miller, & Ustun, 2003).

Few investigations have focused on CVH in older populations. While AHA LS7 metric has been shown to be associated with chronic diseases and mortality, the effect could be modified by age. Yang and colleagues (2012) showed a significant interaction by age (<60 vs. ≥60 years) on associations between CVH and CVD mortality with greater protection among the younger age group, but the absolute numbers of preventable CVD deaths were higher in older participants. Using nationally representative data from the NHANES, Benjamin et al. (2017) reported that younger adults were more likely to meet a greater number of the ideal metrics than older adults and, except for the diet quality component, had a higher prevalence of ideal levels of CVH components. Our study population consisted of individuals above the age of 65 years and older present with a higher prevalence of disability; therefore, it is important to study whether better CVH at an older age is associated disability status. Our results show that higher CVH scores, even at an older age, have protective influences on reducing the risk of disability. Associations were attenuated after excluding participants with stroke, heart failure, and cancer at baseline, especially for the association between ADL disability and CVH, suggesting that these disease conditions may be in the causal pathway and directly lead to higher risk of disability. Protective associations between CVH and worsening of disability status were also observed in the InCHIANTI cohort.

Strengths of this study include the prospective cohort setting which allowed us to examine the associations between baseline CVH on disability over 9 years. The use of two validated and well-documented measures of self-reported functional status, ADL which measures the basic skills needed for everyday living and IADL which examines skills required for independent living, is also a significant strength. In addition, the ability to examine potential confounders and covariates including chronic disease conditions and cognitive status is also a positive. Our study has some limitations, including a relatively small analytical sample size. Approximately 13% of participants who were eligible for these analyses were missing

at least one of the CVH component. At baseline, these individuals were generally older, presented with poor measures of physical function, were more likely to be cognitive impaired and present with depression, and had a higher risk of mortality during follow-up years (Supplementary Table 4), which limits the generalizability of our findings. Almost 35% of participants were missing ADL and IADL disability information at 9-year follow-up, mostly due to death. Similar to those participants missing CVH information at baseline, these individuals were older, more likely to have poor physical function, be cognitive impaired and depressive, and additionally have poor health status for CVH metrics (Supplementary Table 5), which may have led to an underestimation of the association between CVH and disability.

In conclusion, we found an inverse association between higher CVH scores, as measured by the AHA LS7 metric, and disability in older individuals. Better CVH at baseline was also associated with lower odds of disability worsening over the 9-year follow-up. We have previously reported that this CVH score is significantly associated with all-cause and CVD mortality as well as performance-based measures of physical function. Here, we show that CVH is also strongly predictive of development of disability. This underscores the importance of targeting these health and behavior risk factors, particularly in the aged, to reduce morbidity and mortality. Our results need to be confirmed by other longitudinal investigations, and clinicians need to investigate future interventions targeted at improving CVH in older individuals with an overall goal of preventing disability and improving the quality of life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Baseline Sociodemographic and Health Characteristics by the Tertiles of Overall Cardiovascular Health Score Among InCHIANTI Participants Aged 65 Years and Older.

	Overall cardiovascular health score				<i>p</i> value
	Total	First tertile	Second tertile	Third tertile	
	Score:0–12	Score: 0–6	Score: 7–8	Score: 9–12	
<i>n</i>	925	250	375	300	
Covariates					
Female (%)	55	56	58	51	.177
Age (years)	74.1 ± 6.7	74.7 ± 6.8	74.2 ± 6.5	73.4 ± 6.6	.054
Education (years)	5.5 ± 3.2	5.5 ± 3.3	5.5 ± 3.1	5.6 ± 3.4	.919
Impaired cognition ^a (%)	24	25	24	22	.603
Depressed mood ^b , <i>n</i> = 917 (%)	30	33	32	27	.177
Number of chronic diseases (%)					<.001
0	14	8	11	22	
1	35	24	39	38	
2	31	31	32	28	
3	21	37	18	12	
Outcome					
At least one ADL disability (%)	4	5	5	1	.016
At least one IADL disability (%)	19	27	21	11	<.001
Components of cardiovascular health					
Current smoker (%)	14	25	14	6	<.001
Physical activity (%)					<.001
Inactive	17	35	15	3	
Light active	44	50	51	30	
Active	39	14	34	67	
Body mass index (kg/m ²)	27.5 ± 4.0	29.6 ± 4.3	27.6 ± 3.9	25.8 ± 3.1	<.001
Mediterranean diet score	4.5 ± 1.6	3.7 ± 1.6	4.4 ± 1.6	5.2 ± 1.4	<.001
Total cholesterol (mg/dL)	219 ± 38.8	235 ± 39.0	222 ± 35.0	203 ± 37.0	<.001
Systolic blood pressure (mm Hg)	151 ± 19.5	155 ± 16.9	152 ± 19.0	145 ± 20.8	<.001
Diastolic blood pressure (mm Hg)	84.1 ± 8.5	85.6 ± 7.7	84.7 ± 8.4	82.3 ± 9.0	<.001
Fasting plasma glucose (mm/dL)	89 (82–100)	101 (87–121)	88 (81–97)	86 (80–93)	<.001

Note. Data are reported as mean ± standard deviation, percentage, and median (interquartile range). ADL = activities of daily living; IADL = instrumental activities of daily living. The overall cardiovascular health score ranges 0–12 in this cohort.

^a Impaired cognition defined as Mini-Mental State Examination score < 24.

^b Depressed mood defined as the Center for Epidemiological Studies–Depression scale score ≥ 16.

Table 2.

Odds Ratio and 95% Confidence Intervals of ADL and IADL Disability Comparing Across the Tertiles of Baseline Overall CVH Score Among InCHIANTI Participants Aged 65 Years and Older Over a 9-Year Follow-Up Using GEE Model.

Overall CVH score	ADL				IADL			
	Cases ^a	n ^a	OR (95% CI)	p value	Cases ^a	n ^a	OR (95% CI)	p value
All participants ^b	183	925			501	925		
Per 1 point increase			0.77 [0.69, 0.86]	<.001			0.83 [0.77, 0.89]	<.001
Tertile score								
0–6	73	250	1.00		163	250	1.00	
7–8	75	375	0.60 [0.39, 0.92]	.019	201	375	0.62 [0.46, 0.84]	.002
9–12	35	300	0.33 [0.20, 0.54]	<.001	137	300	0.47 [0.34, 0.66]	<.001
Participants free of disability at baseline ^c								
Per 1 point increase	146	888	0.83 [0.73, 0.93]	.002	322	746	0.87 [0.81, 0.94]	<.001
Tertile score								
0–6	60	237	1.00		95	182	1.00	
7–8	55	355	0.51 [0.32, 0.82]	.005	123	297	0.64 [0.46, 0.89]	.009
9–12	31	296	0.38 [0.23, 0.64]	<.001	104	267	0.58 [0.42, 0.82]	.002

Note. Model adjusted for age, sex, years of education (for IADL only), impaired cognition, depressed mood, and number of chronic disease. GEE = generalized estimating equations; CVH = cardiovascular health; ADL = activities of daily living; IADL = instrumental activities of daily living; OR = odds ratio; CI = confidence intervals.

^a n = baseline sample size, cases = number of disability over a 9-year follow-up.

^b Baseline n = 917 for ADL and IADL analysis due to eight missing on depressed mood.

^c Baseline n = 885 for ADL analysis due to three missing on depressed mood; baseline n = 745 for IADL analysis due to one missing on depressed mood.

Table 3.

Odds Ratio and 95% Confidence Intervals of Worsening ADL and IADL Disability Per 1 Unit Baseline Overall CVH Score Increase Among InCHIANTI Participants Aged 65 Years and Older Over a 9-Year Follow-Up Using GEE Model.

Overall CVH score	Worsening ADL disability		Worsening IADL disability	
	OR (95% CI)	<i>p</i> value	OR (95% CI)	<i>p</i> value
All participants				
Per 1 point increase	0.81 [0.73, 0.91]	<.001	0.84 [0.78, 0.90]	<.001
Tertile score				
0–6	1.00		1.00	
7–8	0.56 [0.36, 0.88]	.012	0.50 [0.36, 0.70]	<.001
9–12	0.37 [0.22, 0.63]	<.001	0.48 [0.34, 0.67]	<.001
Participants free of disability at baseline				
Per 1 point increase	0.83 [0.73, 0.93]	.002	0.86 [0.79, 0.94]	.001
Tertile score				
0–6	1.00		1.00	
7–8	0.51 [0.32, 0.83]	.007	0.59 [0.41, 0.85]	.005
9–12	0.38 [0.22, 0.64]	<.001	0.55 [0.38, 0.80]	.002

Note. Model adjusted for age (years), sex, years of education (for IADL only), impaired cognition, depressed mood, and number of chronic disease. GEE = generalized estimating equations; CVH = cardiovascular health; ADL = activities of daily living; IADL = instrumental activities of daily living; OR = odds ratio; CI = confidence intervals.

Table 4.

Hazard Ratio and 95% Confidence Intervals of ADL and IADL Disability Across the Tertiles of Baseline Overall CVH Score Among InCHIANTI Participants Aged 65 Years and Older Over a 9-Year Follow-Up Free of ADL or IADL Disability at Baseline.

Overall CVH score	ADL disability (<i>n</i> = 822)				IADL disability (<i>n</i> = 700)			
	Cases	<i>n</i>	HR (95% CI)	<i>p</i> value	Cases	<i>n</i>	HR (95% CI)	<i>p</i> value
Per 1 point increase			0.86 [0.77, 0.95]	0.005			0.91 [0.86, 0.98]	.007
Tertile score								
0–6	59	222	1.00		95	172	1.00	
7–8	55	327	0.50 [0.33, 0.75]	0.001	123	279	0.74 [0.55, 0.98]	.035
9–12	31	273	0.47 [0.30, 0.73]	0.001	104	249	0.74 [0.55, 0.98]	.038

Note. Model adjusting for age, sex, years of education (for IADL only), impaired cognition, depressed mood, and number of chronic diseases. GEE = generalized estimating equations; CVH = cardiovascular health; ADL = activities of daily living; IADL = instrumental activities of daily living; HR = hazard ratio; CI = confidence intervals.