Journal of the American Heart Association

ORIGINAL RESEARCH

Association of Cardiovascular Health Metrics and Mortality Among Individuals With and Without Cancer

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BACKGROUND: Although metrics of cardiovascular health have been associated with improved mortality, whether the association remains among individuals with a history of cancer has not been well characterized.

METHODS AND RESULTS: The National Health and Nutrition Examination Survey data from 2009 to 2018 were used to identify individuals with and without a history of cancer. For each participant, American Heart Association Life's Essential 8 cardiovascular health metrics of health behaviors (diet, physical activity, nicotine exposure, and sleep) and health factors (body mass index, non–high-density lipoprotein cholesterol, blood glucose, and blood pressure) were obtained. All-cause, cardiovascular, and cancer-related mortality were noted. Out of 21 967 individuals, 8% had a history of cancer. In analyses adjusted for age, race and ethnicity, sex, and income among the whole cohort, better Life's Essential 8 cardiovascular health metrics were associated with lower all-cause (adjusted hazard ratio [aHR], 0.38 [95% CI, 0.29–0.49]; $P<0.001$), cardiovascular (aHR, 0.38 [95% CI, 0.22–0.49]; $P<0.001$), and cancer mortality (aHR, 0.50 [95% CI, 0.31–0.79]; $P=0.001$). This association was driven by better health behaviors that were associated with lower all-cause (aHR, 0.30 [95% CI, 0.26–0.35]; $P<0.001$), cardiovascular (aHR, 0.39 [95% CI, 0.26–0.52]; $P<0.001$), and cancer mortality (aHR, 0.35 [95% CI, 0.26–0.47]; $P<0.001$), whereas better health factors were not associated with lower mortality. There were no significant interactions in these associations between individuals with and without cancer.

CONCLUSIONS: Better metrics of cardiovascular health, particularly health behaviors, are associated with improved all-cause, cardiovascular, and cancer mortality to a similar extent in individuals with and without cancer. Attempts to improve cardiovascular health should be prioritized similarly among individuals with and without cancer.

Key Words: cancer ■ cardiovascular health ■ mortality

Cardiovascular disease (CVD) and cancer are the leading causes of death in the United States and may share common pathophysiologic pathways due to similar risk factors as well as inflammation and neurohormonal activation associated with both conditions.[1,2] In an effort to further characterize cardiovascular health, the American Heart Association introduced the Life's Essential 8 (LE8) cardiovascular health (CVH) rubric composed of measures of 4 health behaviors (smoking, diet, physical activity, and sleep) and 4 health factors (body size, cholesterol, glucose, and blood pressure).[3] Better scores on these metrics have been associated with lower rates of CVD and all-cause mortality.[4] Likewise, healthy behaviors have been associated with lower rates of cancer and improved outcomes in the cancer population.[5,6] However, LE8 metrics are known to differ between individuals with and without cancer,[7] and there are no data on

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This article was sent to Tochukwu M. Okwuosa, DO, Associate Editor, for review by expert referees, editorial decision, and final disposition.

Supplemental Material is available at https://www.ahajournals.org/doi/suppl/10.1161/JAHA.123.032683

For Sources of Funding and Disclosures, see page 7.

JAHA is available at: www.ahajournals.org/journal/jaha

CLINICAL PERSPECTIVE

What Is New?

- Better metrics of cardiovascular health, particularly cardiovascular behaviors such as optimal diet, physical activity, nicotine avoidance, and sleep, are associated with lower mortality to a similar extent among individuals with and without a history of cancer.

What Are the Clinical Implications?

- Attempts to improve cardiovascular health, particularly through optimizing health behaviors, should be prioritized similarly among individuals with and without cancer.

Nonstandard Abbreviations and Acronyms

LE8	Life's Essential 8
CVH	cardiovascular health
NHANES	National Health and Nutrition Examination Survey

whether LE8 CVH metrics have similar relationships with clinical outcomes based on the presence or absence of a concomitant cancer diagnosis. The effects of CVH on outcomes may differ between individuals with and without cancer for a variety of reasons; for example, the effects of cardiovascular risks on outcomes in individuals with cancer may be attenuated due to greater competing risks from the underlying cancer or enhanced due to shared risk factors between cancer and CVD. Understanding the relationship between CVD risk factors and mortality in individuals with cancer is particularly important due to improved survival from the underlying malignancy and increasing CVD risk over time among cancer survivors.[8] Therefore, we sought to assess the association between LE8 CVH metrics and mortality from CVD, cancer, and all causes in individuals without known CVD, with and without cancer. Furthermore, we wanted to evaluate whether LE8 health factors and health behaviors had distinct associations with mortality in individuals with and without cancer.

METHODS

The data for this analysis are publicly available. US Centers for Disease Control and Prevention's National Center for Health Statistics and can be accessed at https://www.cdc.gov/nchs/nhanes/index.htm.

Study Population

The National Health and Nutrition Examination Survey (NHANES) is a series of nationally representative studies designed to monitor the health of the US population. Participants are selected from the US noninstitutionalized, civilian population,[9] with the data being publicly available.[10] NHANES data set research protocol was approved by the National Center for Health Statistics Ethics Review Board, and each participant signed an informed consent. During the informed consent process, survey participants are assured that data collected will be used only for stated purposes.[11] Because the data are publicly available, an individual's consent for this specific analysis was not required, and this research was exempt from institutional review board approval. This study adhered to the research standards as outlined in the Declaration of Helsinki.

This analysis used 10 years of data from the 2009 to 2018 NHANES cycles, and data were linked with data from the NHANES Linked Mortality File, which links participants of NHANES >18 years of age with death records in the National Death Index data set through December 31, 2019, which are the latest mortality data available. NHANES collects samples in 2-year cycles. The total combined sample of NHANES between 2009 and 2018 comprised 30 352 adult participants, which is the sample size at baseline. We excluded individuals having a self-reported history of coronary heart disease, angina, heart attack, or stroke, and those with incomplete information for all 8 CVH components, cancer, or CVD (Figure S1).

Demographic and Social Characteristics

Demographic characteristics and cancer status were queried during the home interview. Participants were stratified by cancer status. Household poverty as a measure of socioeconomic status was calculated as the ratio of monthly family income to poverty levels and categorized as low (≤1.30), low-middle (1.31–1.85), middle (1.86–3.50), and high income (>3.50).[3]

Quantification of Cardiovascular Health Scores

A method for calculating LE8 scores using NHANES data was previously described,[3] and details are provided in Table S1. Briefly, scores of diet, physical activity, nicotine exposure, and sleep were based on data collected in questionnaires. Obesity and blood pressure were measured at the examination centers, and non–high-density lipoprotein cholesterol and blood glucose scores were based on blood sample testing. We grouped the 4 health behaviors (diet, physical activity, nicotine exposure, and sleep) and 4 health factors (body mass index, non–high-density lipoprotein

cholesterol, blood glucose, and blood pressure) metrics. Briefly, health behaviors scores were based on specific questionnaires data, and body mass index score was based on the physical measurement, as was the blood pressure score, and the non–high-density lipoprotein cholesterol and blood glucose scores were based on laboratory data. Full details for scoring are provided in Table S1, with higher scores reflecting better health on each factor or behavior. The overall CVH was calculated for each individual by averaging the scores for each of the 8 metrics; similarly, we calculated the health behavior and health factor scores using the relevant metrics to provide scores ranging from 0 to 100. Higher scores on the metrics imply better health factors or behaviors (ie, better diet, more physical activity, less nicotine exposure, better sleep). We categorized overall CVH, health factors, and health behavior into 3 levels (low: <50, moderate: 50–79, high: ≥80) following the American Heart Association's recommendations.[12]

Assessment of Mortality Status

The mortality of each participant in the NHANES was determined through a record match to death certificate records from the National Death Index. Vital status was ascertained from additional sources, including information obtained from linkages with the US Social Security Administration or by active follow-up of survey participants. Follow-up time for each outcome was counted from the baseline examination date until the registered date of death or the end of the study (December 31, 2019), whichever occurred first. All adult participants included in the NHANES have assumed data on vital status updated until December 31, 2019. The primary outcomes of interest in this study were mortality from all causes, cardiovascular mortality (codes I00-I09, I11, I13, I20-I51, and I60–I69), or cancer mortality (codes C00-C97), and compliance with the codes of the *International Classification of Diseases, Tenth Revision* (*ICD-10*). Because follow-up time was until any event of mortality, individuals were censored for cancer mortality if they died of CVD and vice versa. Only individuals with complete data to mortality or end of the study period were included in this analysis, without the need to censor data for the primary outcome of all-cause mortality.

Statistical Analysis

NHANES oversamples people ≥60 years of age and Black and Hispanic people. To ensure nationally representative estimates, sampling weights were considered in all analyses to account for oversampling of subgroups and complex sample design. Continuous variables are presented as mean and standard error, and categorical data are presented as percentages and frequencies. Categorical variables were compared using the Pearson χ^2 test, whereas continuous variables were compared using the Student *t* test or the Mann-Whitney *U* test. Cox proportional hazard models were used to evaluate the association between the levels of overall CVH, health factors, and health behavior and risk of mortality, and follow-up time was used as the underlying time metric. We further tested the interaction between health metrics and cancer status on mortality, using alternative models with the interaction variables. Follow-up time was calculated from date of interview or examination until date of death or the end of the study (December 31, 2019). We performed univariate and multivariate analyses. The multivariate models were adjusted for age group, sex, and race, ethnicity, and ratio of family income to poverty and were calculated according to cancer status. Proportionality assumptions for the Cox models were assessed based on Schoenfeld residual testing. In this method, correlation of time with the residuals between the observed and expected values of covariates in each failure time point is examined. We did not observe any significant correlation of residuals with time that may be interpreted as a violation of the proportionality assumption. All analyses were performed using STATA SE version 17.0 (StataCorp, College Station, TX) and SPSS version 26 (IBM, Armonk, NY).

RESULTS

We identified 21 967 individuals, including 20 215 (92.0%) without a history of cancer and 1752 (8.0%) with a history of cancer. Individuals with cancer were older (61.3 versus 44.5 years of age, $P<0.001$), were more likely to be women, more likely to be non-Hispanic White, and had higher family income (Table 1). Individuals with cancer had lower total LE8 scores (63.2 versus 65.8, $P<0.001$), although this included a combination of higher health behavior scores (68.6 versus 67.7, $P<0.001$) and lower health factor scores (57.8 versus 63.9, $P<0.001$). The number of individuals with each category of LE8 scores is shown in Table S2.

Crude mortality rates for all-cause, CVD, and cancer mortality based on LE8 scores in individuals with and without cancer are shown in Figure S2. Individuals with cancer had higher all-cause, CVD, and cancer mortality compared with individuals without cancer for all categories of LE8 scores, with individuals at lower LE8 scores demonstrating the highest absolute mortality rates. Univariate hazard ratios for individuals with and without cancer for LE8 metrics, as well as metrics separated into health factors and health behaviors, are shown in Table S3. Univariate analyses revealed an association between better LE8 metrics and decreased mortality. However, the association tended to be

Table 1. Baseline Characteristics by Cancer Status

Characteristic	No cancer	Any cancer	*P* value
No. of participants	20215	1752	
Age, y, mean (SE)	44.5 (0.01)	61.3 (0.02)	<0.001
Age, y			
18–39	42.0%	9.7%	<0.001
40–64	45.9%	43.9%	
65–79	10.0%	35.3%	
≥80	2.2%	11.1%	
Sex			
Men	48.4%	41.5%	<0.001
Women	51.6%	58.5%	
Self-reported race and ethnicity			
Mexican American	9.7%	2.9%	<0.001
Other Hispanic	6.6%	3.0%	
Non-Hispanic White	63.5%	86.3%	
Non-Hispanic Black	11.2%	4.4%	
Other race and ethnicity	9.0%	3.3%	
Ratio of family income to poverty			
<1.31	22.2%	12.8%	<0.001
1.31–1.85	10.5%	8.1%	
1.86–3.5	24.5%	25.1%	
>3.5	42.7%	54.1%	
AHA LE8 scores			
Low LE8 Score	12.9%	15.4%	<0.001
Moderate LE8 Score	70.1%	74.8%	
High LE8 Score	17.0%	9.8%	
AHA LE8 scores (100 possible points), mean (SE)			
Total LE8 score	65.8 (0.01)	63.2 (0.01)	<0.001
Health behaviors score	67.7 (0.01)	68.6 (0.02)	<0.001
Tobacco or nicotine exposure score	73.4 (0.01)	75.6 (0.01)	<0.001
Diet score	50.9 (0.01)	57.0 (0.01)	<0.001
Physical activity score	62.9 (0.01)	56.2 (0.01	<0.001
Sleep health score	83.7 (0.01)	85.8 (0.01)	<0.001
Health factors score	63.9 (0.01)	57.8 (0.02)	<0.001
BMI score	60.3 (0.01)	60.4 (0.04)	<0.001
Blood lipids (non-HDL cholesterol) score	39.5 (0.01)	34.4 (0.03)	<0.001
Blood glucose score	84.9 (0.01)	77.4 (0.01)	<0.001
Blood pressure score	71.2 (0.01)	59.0 (0.01)	<0.001

AHA indicates American Heart Association; BMI, body mass index; HDL, high-density lipoprotein; and LE8, Life's Essential 8.

statistically greater among individuals without cancer compared with those with cancer, which may be due to differences in baseline characteristics. For example, in these univariate analyses, individuals with cancer did not demonstrate improved all-cause and CVD mortality with higher health factor scores compared with lower health factor scores.

Given differences in baseline characteristics, analyses adjusted for age, race and ethnicity, sex, and ratio of family income to poverty are presented in Table 2. The overall cohort with high (healthiest tertile) versus low LE8 (least healthy tertile) scores demonstrated lower all-cause mortality (adjusted hazard ratio [aHR, 95% CI], 0.38 [0.29–0.49]; *P*<0.001), CVD mortality (aHR [95% CI], 0.38 [0.22–0.64]; *P*<0.001), as well as cancer mortality (aHR [95% CI], 0.50 [0.31–0.79]; *P*=0.001). There were no significant interactions in these outcomes between individuals with and without concomitant cancer. When the LE8 was further divided into health behaviors and health factors, the overall health behaviors metric demonstrated a significant association between higher scores and lower all-cause (aHR [95% CI], 0.30 [0.26–0.35]; *P*<0.001), CVD (aHR [95% CI], 0.39 [0.25–0.53]; *P*<0.001), and cancer (aHR [95% CI], 0.35 [0.26–0.47]; *P*<0.001) mortality, whereas the overall health factors metric demonstrated no association between higher scores and all-cause (aHR [95% CI], 1.09 [0.92–1.30]; *P*=0.27), CVD (aHR [95% CI], 0.68 [0.45–0.02]; *P*=0.06), and cancer (aHR [95% CI], 1.03 [0.96–1.16]; *P*=0.80) mortality. There were no significant interactions in these associations between individuals with and without cancer.

DISCUSSION

Our analysis relating LE8 scores to mortality among individuals with and without a cancer diagnosis demonstrates several notable findings. Among the whole study cohort, LE8 scores as a measure of CVH were associated with improved all-cause mortality, CVD mortality, as well as cancer mortality. When the LE8 score was divided into health behaviors and health factors, better health behaviors were associated with all-cause, CVD, and cancer mortality, whereas better health factors were nearly associated with lower CVD mortality but were not associated with all-cause or cancer mortality. These associations were similar between individuals with and without a history of cancer, which has important implications by highlighting the beneficial association between CVH metrics and mortality in the cancer population.

Although prior studies have described the association between lifestyle metrics and mortality, including cancer mortality, in the general population,[1] there are no data about whether the relationship between CVH

Table 2. Adjusted* Hazard Ratio (95% CI) of Overall, Cardiovascular, and Cancer Mortality by Overall CVH, Health Factors, and Health Behaviors Score Categories

Factor	Category	Overall (n=21 967)	No cancer (n=20 215)	Any cancer (n=1752)	*P* interaction value
Overall CVH	All-cause mortality*				
	Low LE8 score	1	1	1	
	Moderate LE8 Score	0.64 (0.59–0.70), *P*<0.001	0.63 (0.57–0.70), *P*<0.001	0.68 (0.57–0.83), *P*<0.001	0.40
	High LE8 score	0.38 (0.29–0.49), *P*<0.001	0.35 (0.26–0.48), *P*<0.001	0.51 (0.31–0.84), *P*=0.008	
	Cardiovascular mortality*				
	Low LE8 score	1	1	1	
	Moderate LE8 Score	0.61 (0.51–0.74), *P*<0.001	0.67 (0.54–0.82), *P*=<0.001	0.46 (0.32–0.68), *P*<0.001	0.12
	High LE8 Score	0.38 (0.22–0.64), *P*<0.001	0.34 (0.18–0.64), *P*=0.001	0.49 (0.19–1.27), *P*=0.14	
	Cancer mortality*				
	Low LE8 score	1	1	1	
	Moderate LE8 score	0.73 (0.60–0.88), *P*=0.001	0.72 (0.56–0.91), *P*=0.07	0.78 (0.67–1.08), *P*=0.13	0.89
	High LE8 score	0.50 (0.31–0.79), *P*=0.001	0.50 (0.29–0.89), *P*=0.02	0.60 (0.27–1.33), *P*=0.2	
Health factors	All-cause mortality*				
	Low health factors score	1	1	1	
	Moderate health factors score	0.90 (0.82–0.99), *P*=0.04	0.86 (0.77–0.95), *P*=0.004	1.07 (0.89–1.29), *P*=0.46	0.29
	High health factors score	1.09 (0.92–1.30), *P*=0.27	1.06 (0.88–1.27), *P*=0.66	0.94 (0.82–1.10), *P*=0.48	
	Cardiovascular mortality*				
	Low health factors score	1	1	1	
	Moderate health factors score	0.75 (0.63–0.89), *P*=0.002	0.78 (0.63–0.95), *P*=0.01	0.67 (0.46–0.98), *P*=0.04	0.46
	High health factors score	0.68 (0.45–1.02), *P*=0.06	0.64 (0.40–1.02), *P*=0.06	0.89 (0.38–2.08), *P*=0.78	
	Cancer mortality*				
	Low health factors score	1	1	1	
	Moderate health factors score	1.07 (0.89–1.30), *P*=0.46	1.06 (0.84–1.35), *P*=0.63	1.10 (0.80–1.52), *P*=0.54	0.32
	High health factors score	1.03 (0.96–1.14), *P*=0.80	0.97 (0.62–1.51), *P*=0.89	1.05 (0.86–1.32), *P*=0.63	
Health behaviors	All-cause mortality*				
	Low health behaviors score	1	1	1	
	Moderate health behaviors score	0.60 (0.55–0.66), *P*<0.001	0.59 (0.53–0.66), *P*<0.001	0.67 (0.55–0.82), *P*<0.001	0.85
	High health behaviors score	0.30 (0.26–0.35), *P*<0.001	0.29 (0.24–0.35), *P*<0.001	0.35 (0.26–0.46), *P*<0.001	
	Cardiovascular mortality*				
	Low health behaviors score	1	1	1	
	Moderate health behaviors score	0.71 (0.58–0.86), *P*<0.001	0.73 (0.59–0.91), *P*=0.005	0.65 (0.42–0.99), *P*=0.04	0.68
	High health behaviors Score	0.39 (0.29–0.53), *P*<0.001	0.39 (0.27–0.55), *P*<0.001	0.39 (0.22–0.71), *P*=0.002	
	Cancer mortality*				
	Low health behaviors score	1	1	1	
	Moderate health behaviors score	0.57 (0.47–0.69), *P*<0.001	0.50 (0.39–0.63), *P*<0.001	0.81 (0.58–1.14), *P*=0.23	0.37
	High health behaviors score	0.35 (0.26–0.47), *P*<0.001	0.33 (0.23–0.48), *P*<0.001	0.42 (0.26–0.69), *P*=0.001	

P value for proportionality assumption >0.05 indicates no significant deviation from proportionality. CVH indicates cardiovascular health; and LE8, Life's Essential 8.

*Adjusted for age group, race and ethnicity, sex, and ratio of family income to poverty. Reference is the low score group.

metrics and mortality differs between individuals with and without cancer. The relationship between CVH metrics and mortality in those with cancer may differ from the relationship seen in the general population. For example, individuals with cancer face unique CVD risks due to cancer treatment itself (ie, chemotherapy, immunotherapy, or radiation therapy) as well as due to inflammatory or neurohormonal pathways that link CVD and cancer, which may diminish the role of traditional CVH factors on mortality compared with the general population.[1,2] Alternatively, CVH factors may have an exaggerated association with outcomes in individuals with cancer, because measures of worse CVH have been associated with higher cancer incidence[6] and higher CVD mortality in the cancer population.[5] Our results expand on this prior literature, with findings that the association between CVH scores, specifically measured by the LE8 rubric, and mortality extends to the cancer population similarly to the general population.

Similarities in outcomes between those with and without cancer highlight the need to further study the interaction between CVD risks, CVH, and health outcomes in the cancer population, and our study suggests that optimizing CVH may counterbalance the unique CVD risks faced by individuals with cancer.

For example, physical activity among individuals with cancer has been associated with improved metabolism, reduced inflammation, and favorable gene expression, which may directly impact prognosis.[5] Additionally, physical activity may be a marker of lower cancer severity, better physiological reserve, greater treatment tolerability, and other factors that may be less modifiable but may indirectly account for the association between CVH metrics and improved outcomes. Likewise, healthy diet and improved sleep in individuals with cancer have been associated with favorable metabolic and anti-inflammatory changes, which may lead to improved prognosis.[13,14] In the context of prior studies that demonstrate shared risk factors between CVD and cancer,[1] as well as growing risk of CVD events in patients with cancer in an era of improving cancer prognosis,[8] our results highlight the potential importance of addressing health behaviors in individuals with cancer to improve not only survival from cancer but also survival from CVD as well as all causes.

The relationship between the CVH factors identified in LE8 and outcomes in cancer survivors is particularly important because of limited and discordant data on the accuracy of traditional CVD risk assessment tools in this population.[15,16] Prior studies have reported that risk scores such as the atherosclerotic cardiovascular risk score and Framingham may overestimate[15] or underestimate[17] CVD risk among individuals with prior cancer. Given the prognostic value of simple LE8 CVH metrics on outcomes, our results support the incorporation of screening for these metrics in cancer survivorship clinics alongside other traditional CVD risk scores to potentially guide public health interventions and risk reduction strategies. Specifically, we demonstrate that individuals who exhibit low health behavior metrics constitute a high-risk population and may benefit from targeted interventions. In this regard, educational level, socioeconomic factors, and psychological constraints have been identified as predictors of lifestyle changes after a cancer diagnosis.[18] Further efforts, including those found to be effective as prospective interventions,[19] are therefore needed to address barriers to improved CVH. Ongoing appreciation of the risk of CVH metrics on outcomes may enhance clinician efforts in both risk factor discussion and risk factor modification, particularly given prior data that health promotion is frequently not addressed as part of cancer care.[20]

Additional studies will be required to examine the predictive accuracy of CVH metrics compared with traditional cardiovascular risk scores in individuals with cancer and to determine if targeted efforts to improve CVH metrics are able to modify an individual's mortality from cancer or noncancer causes. Future studies will also need to determine whether the type of cancer or cancer treatment may modify the relationship between CVH metrics and outcomes. Additional studies should also strive to understand potential differences between the effects of health factors and health behaviors, as well as their individual components, on outcomes in individuals with and without cancer. Health factors demonstrated less consistent association with mortality in our analysis both in those with and without cancer, although with a trend of improved health factors being associated with lower CVD mortality, which may be due to exclusion of individuals with preexisting cardiovascular disease or smaller sample size in that cohort. Nevertheless, further studies will be needed to examine whether individual components compromising the health factor score (such as body mass index) may retain important associations with outcomes.

Our results have limitations. Important variables on cancer treatment and interval between cancer diagnosis and data collection are not available. There may also be other unknown covariates which are not evaluated in this data set but that may have significant impact on the association between and individual's characteristics, CVH metrics, and outcomes. Additionally, we had to exclude participants with incomplete data, which may impact the generality of our results. We relied on the cause of mortality as listed in the NHANES, which may be difficult to accurately determine, but we also report all-cause mortality. Individuals who emigrated out of the United States may not have their mortality captured, which may affect overall results. Furthermore, due to the relatively small number of individuals with

cancer, our analysis included all types of malignancies without differentiation between different types of cancer. The small number of individuals with cancer in this analysis may reduce the power to answer the question about mortality differences between individuals with and without cancer; this also contributes to the large confidence intervals for the cancer cohort seen in our study. Data on the role of individual health behaviors and factors on outcomes, as well as the role of sex and ethnicity on lifestyle changes, are not presented. Because of the smaller sample size of individuals with cancer, some analyses of mortality have wide confidence intervals, although hazard ratios and interaction analyses imply similar association among individuals with and without cancer. Nevertheless, the limitations should be weighed against the significant strengths of this study as the first investigation to evaluate the predictive potential of the LE8 CVH metrics in individuals with cancer compared with the general population.

In conclusion, we demonstrate that better CVH as measured by LE8 is associated with improved all-cause, CVD, and cancer mortality to a similar extent in individuals with and without cancer, with the association between CVH and outcomes predominantly driven by health behaviors such as smoking, diet, physical activity, and sleep. Attempts to improve CVH, particularly through optimal health behaviors, should be prioritized similarly among individuals with and without cancer.

ARTICLE INFORMATION

Received September 14, 2023; accepted January 26, 2024.

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Sources of Funding

None.

Disclosures

None.

Supplemental Material

Tables S1–S3
Figures S1–S2

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