

Online Supplementary Material

Comparative Discrimination of Life’s Simple 7, Life’s Essential 8, and Life’s Crucial 9: Evaluating the Impact of Added Complexity on Mortality Prediction

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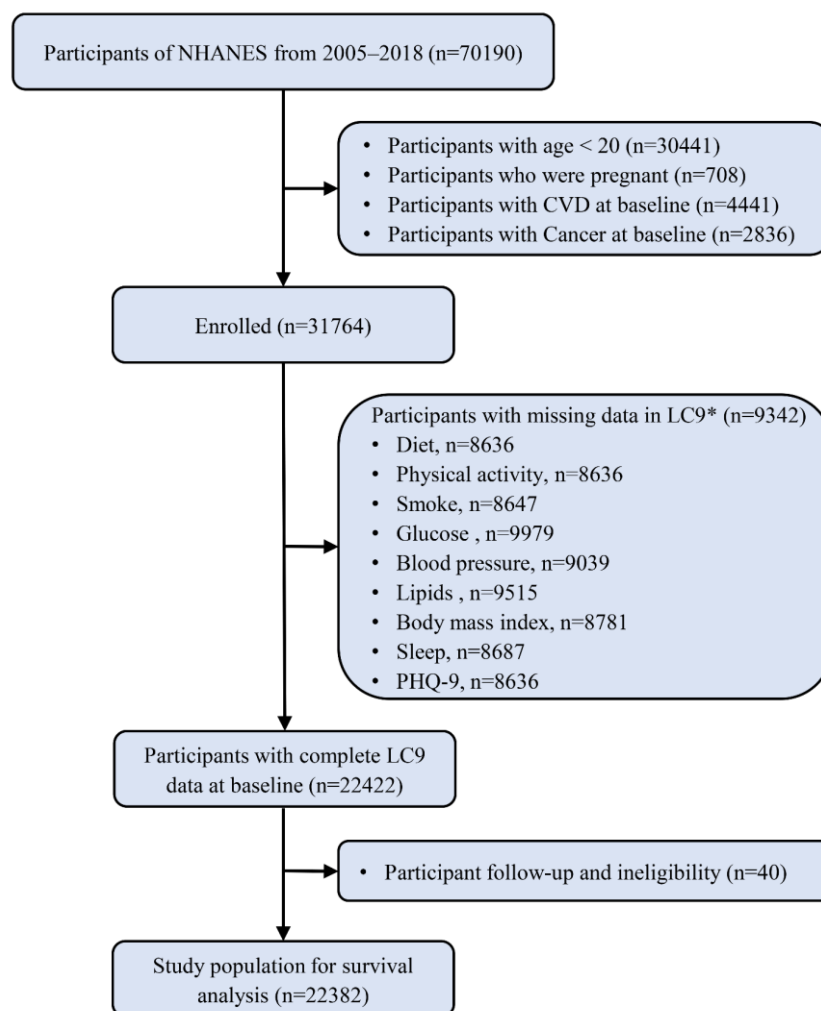


Fig. S1 Flowchart of the study; * Life's Crucial 9 score (LC9) was computed when data were available for 8 or 9 components. PHQ, Patient Health Questionnaire

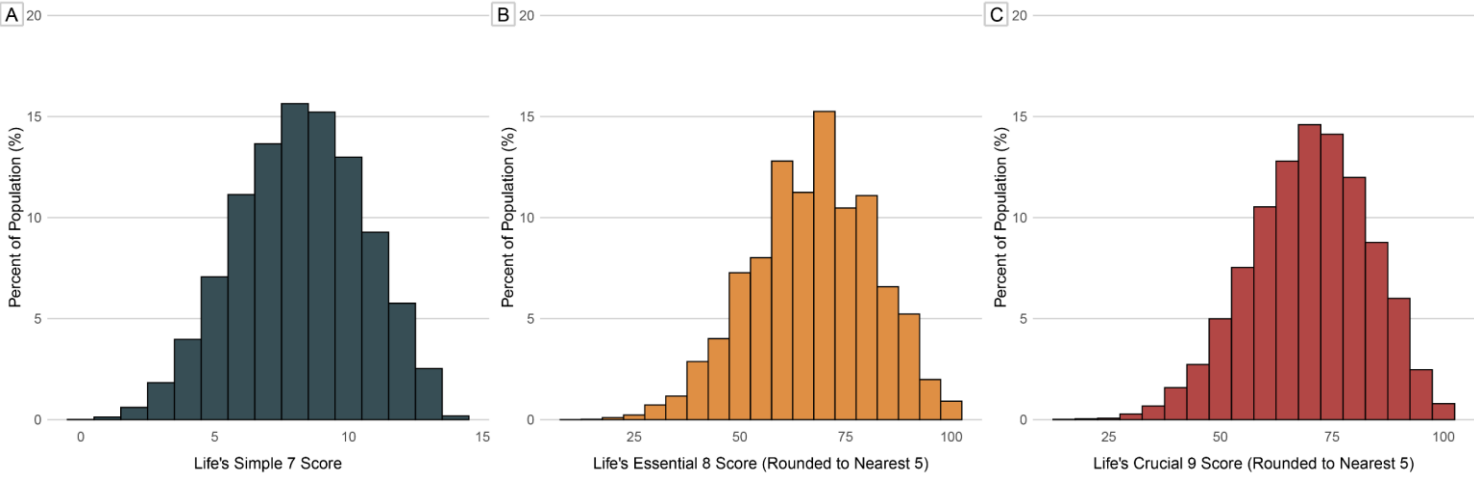


Fig. S2 Distribution of cardiovascular health scores among adults in NHANES 2005–2018.

The distributions of Life’s Simple 7 (LS7, panel A), Life’s Essential 8 (LE8, panel B), and Life’s Crucial 9 (LC9, panel C) scores are displayed for adults included in NHANES 2005–2018. Scores are categorized into predefined levels, and the proportions of participants within each category are shown.

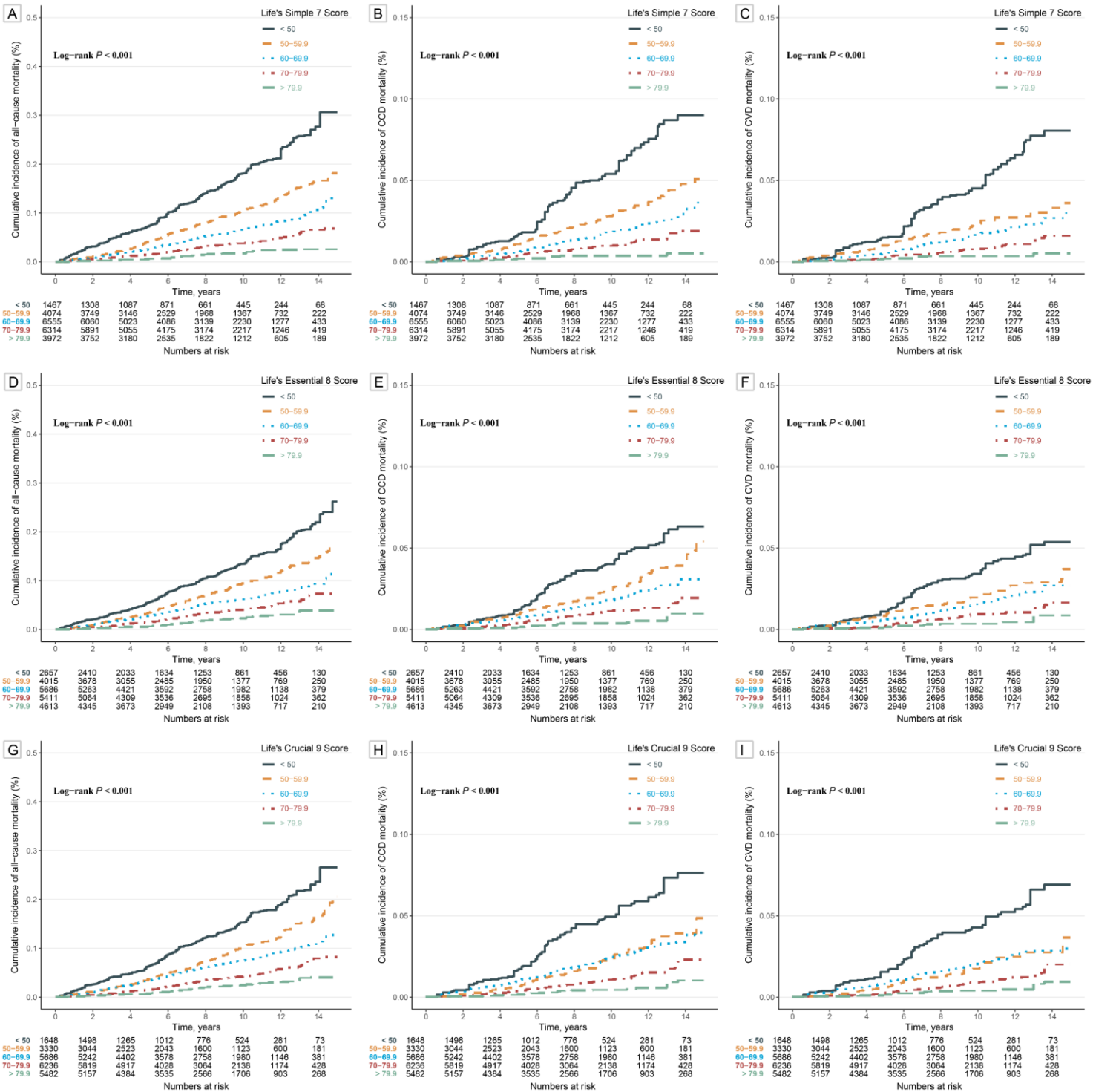


Fig. S3 Kaplan-Meier curves for cumulative incidence of mortality by cardiovascular health scores levels.

Cumulative incidence curves for all-cause mortality (panels A, D, G), cardio-cerebrovascular (CCD) mortality (panels B, E, H), and cardiovascular (CVD) mortality (panels C, F, I) are shown across different levels of Life's Simple 7 (LS7, panels A–C), Life's Essential 8 (LE8, panels D–F), and Life's Crucial 9 (LC9, panels G–I) scores. The curves represent the proportion of cumulative mortality over the follow-up period for each score category. Log-rank tests were used to assess differences between score levels.

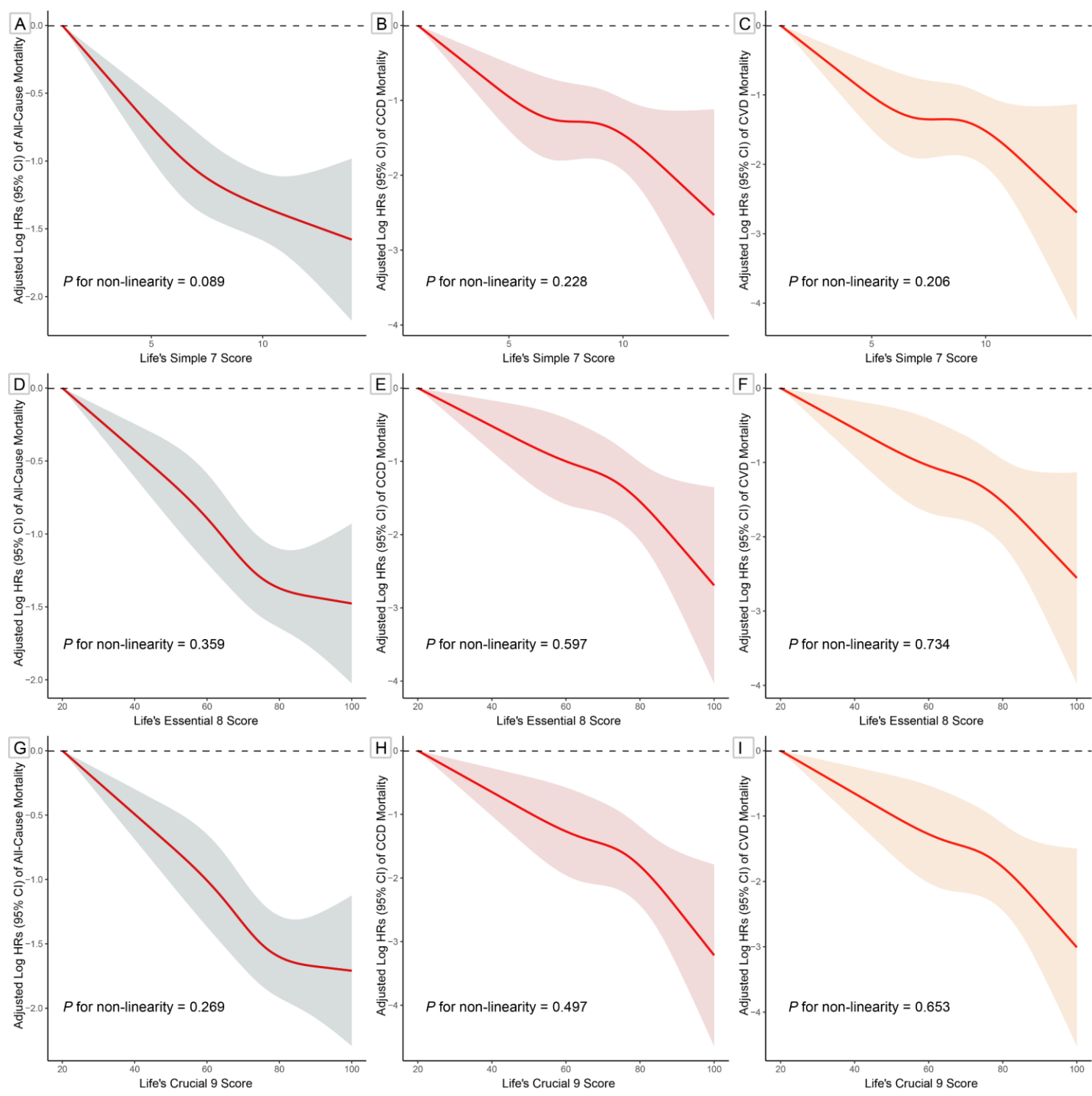


Fig. S4 Restricted cubic spline analyses of cardiovascular health scores and mortality outcomes.

Restricted cubic spline models illustrate the associations between cardiovascular health scores and all-cause mortality, cardio-cerebrovascular (CCD) mortality, and cardiovascular (CVD) mortality for Life’s Simple 7 (LS7, panels A–C), Life’s Essential 8 (LE8, panels D–F), and Life’s Crucial 9 (LC9, panels G–I). Solid red lines represent adjusted hazard ratios (HRs), with shaded areas indicating 95% confidence intervals (CIs). The lowest score for each cardiovascular health metric was used as the reference value. Analyses were adjusted for age (40-59, or ≥ 60), sex (male or female), race/ethnicity (non-Hispanic White, non-Hispanic Black or other race), education level (below high school, high school, or above high school), marital status (married/living with partner, or single/divorced/widowed), family PIR (≤ 1.0 , 1.1–3.0, or > 3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).

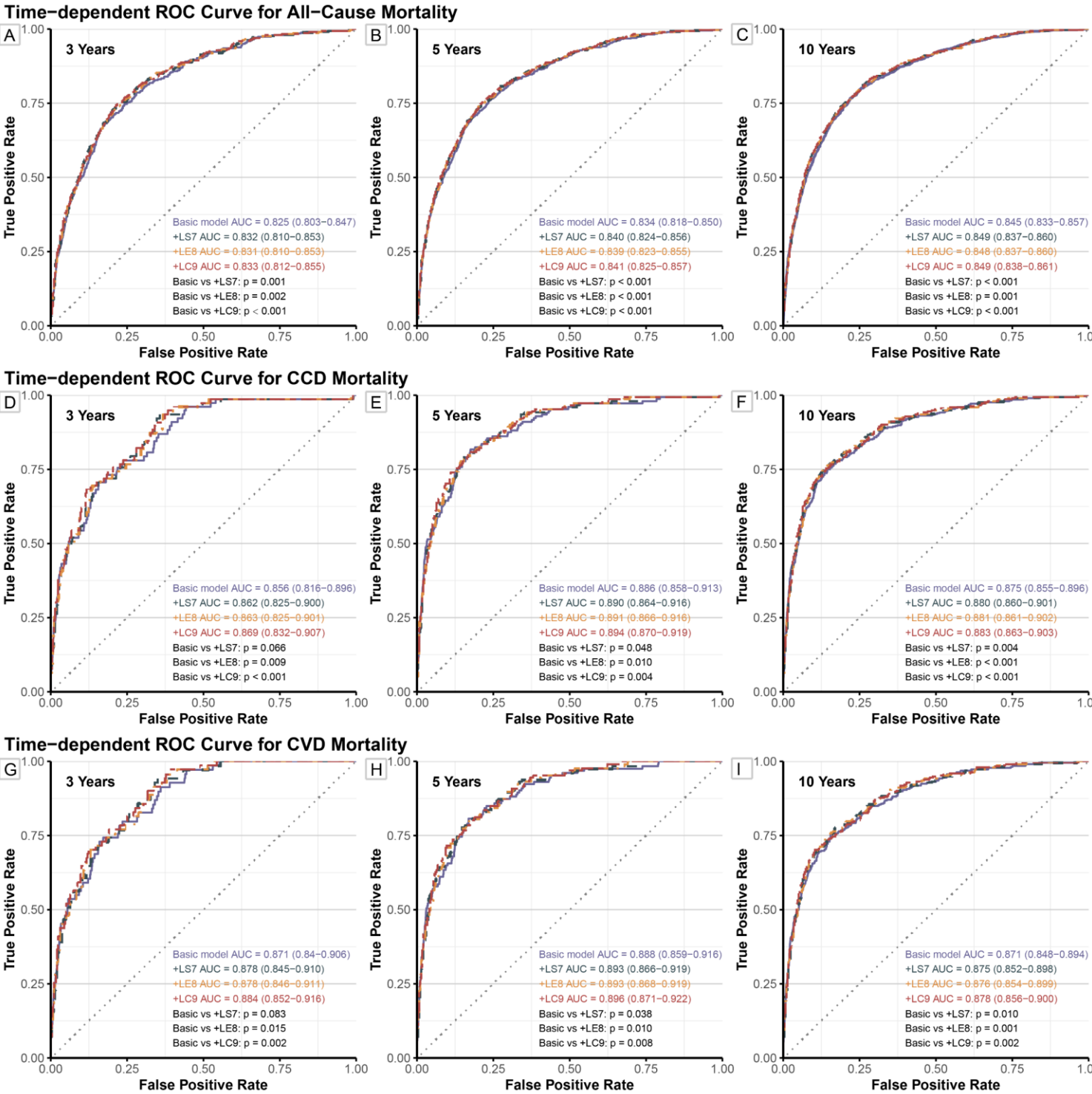


Fig. S5 Incremental predictive value of cardiovascular health scores for mortality outcomes.

Area under the curve (AUC) values are presented for the baseline model and the baseline model with the addition of Life’s Simple 7 (LS7), Life’s Essential 8 (LE8), and Life’s Crucial 9 (LC9) for predicting all-cause mortality (panels A–C), cardio-cerebrovascular (CCD) mortality (panels D–F), and cardiovascular (CVD) mortality (panels G–I) at 3-, 5-, and 10-year follow-ups. The baseline model includes age, sex, race/ethnicity, education level, marital status, family PIR, and drinking status.

Table S1 Definition and scoring approach for the American Heart Association’s Life's Simple 7 score.

CVH metric	Definition		
	Poor (0 points)	Intermediate (1 point)	Ideal (2 points)
Smoking ^a	Current smoking	Former smoker, quit≤12 months prior	Never or quit>12 months prior
BMI ^b	30.0 kg/m ²	25.0–29.9 kg/m ²	<25.0 kg/m ²
Physical Activity ^c	None	1-149 min/week moderate intensity or 1-74 min/week vigorous intensity or 149 min/week moderate + vigorous	≥150 min/week moderate intensity or ≥75 min/week vigorous intensity or ≥150 min/week moderate + vigorous
TC ^d	≥240 mg/dL	200-239 mg/dL or treated to goal	<200 mg/dL, untreated
Blood Pressure ^e	SBP≥140 or DBP≥90 mm Hg	SBP 120–139 or DBP 80–89 mm Hg or treated to goal	<120/<80 mm Hg untreated
FBG ^f	≥126 mg/dL	100-125 mg/dL or treated to goal	<100 mg/dL untreated
Diet ^g	HEI-2015 Tertile 1	HEI-2015 Tertile 2	HEI-2015 Tertile 3

Abbreviations: CVH, cardiovascular health; BMI, body mass index; FBG, fasting blood glucose; TC, total cholesterol; HEI-2010, healthy eating index 2010.

^a Smoking status was solely self-reported during the NHANES interview.

^b BMI was measured by trained personnel using standardized procedures during study visits and calculated as weight in kilograms divided by the square of height in meters.

^c Physical activity was assessed using a Computer-Assisted Personal Interview (CAPI) system. Participants reported the frequency and duration of moderate and vigorous physical activities over the past 30 days. Classifications were based on American Heart Association recommendations.

^d Total cholesterol was measured using standard laboratory assays. The classification considers both the measured cholesterol levels and self-reported use of lipid-lowering medication.

^e Blood pressure was obtained using standardized measurement protocols, and the average of available readings was used. Self-reported use of antihypertensive medication was also considered.

^f Fasting blood glucose was determined using colorimetric reflectance spectrophotometry after an overnight fast. The classification also accounts for self-reported use of insulin or oral hypoglycemic agents.

^g Dietary intake was assessed through interviewer-administered 24-hour dietary recalls. The HEI-2015 is an updated measure of diet quality based on the 2015–2020 Dietary Guidelines for Americans. It consists of 13 components: nine adequacy components (total fruits, whole fruits, vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fluids) and four moderation components (refined grains, sodium, added sugars, and saturated fats). Each component is scored from 0 to 10, with higher scores indicating better adherence to dietary recommendations. The total HEI-2015 score ranges from 0 to 100, with higher scores reflecting healthier diets that align more closely with the guidelines.

Table S2 Definition and scoring approach for the American Heart Association’s Life’s Essential 8 score and Life's Crucial 9*.

CVH metric	Quantification of CVH metric	
Diet ^a	Points	Healthy Eating Index-2015 (for populations)
	100	95th percentile (top/ideal diet)
	80	75th–94th percentile
	50	50th–74th percentile
	25	25th–49th percentile
	0	1st–24th percentile (bottom/least ideal quartile)
Physical activity ^b	Points	Minutes of moderate to vigorous physical activity per week
	100	≥150 minutes
	90	120-149 minutes
	80	90-119 minutes
	60	60-89 minutes
	40	30-59 minutes
	20	1-29 minutes
	0	0 minutes
Tobacco/nicotine exposure ^c	Points	Combustible tobacco, inhaled NDS use; or secondhand smoke exposure
	100	Never smoker
	75	Former smoker, quit ≥ 5 yrs
	50	Former smoker, quit 1–5 yrs
	25	Former smoker, quit <1 yrs, or currently using inhaled NDS
	0	Current smoker
	Subtract 20 points (unless score is 0) for living with active indoor smoker in home	
Sleep health ^d	Points	Average hours of sleep per night
	100	7-9 hours
	90	9-10 hours
	70	6–7 hours
	40	5–6 or ≥10 hours
	20	4–5 hours
	0	<4 hours
BMI ^e	Points	BMI
	100	<25 kg/m2
	70	25.0-29.9 kg/m2
	30	30.0-34.9 kg/m2
	15	35.0-39.9 kg/m2
	0	≥ 40.0 kg/m2
Blood lipid ^f	Points	Non-HDL cholesterol
	100	<130 mg/dL
	60	130-159 mg/dL
	40	160-189 mg/dL
	20	190-219 mg/dL
	0	≥ 220 mg/dL
	If drug-treated, subtract 20 points	
Blood glucose ^g	Points	FBG or HbA1c

	100	No history of diabetes and
	80	FBG<100 mg/dL or HbA1c <5.7%
	60	No diabetes and FBG 100–125 mg/dL or HbA1c 5.7–6.4%
	40	Diabetes with HbA1c <7.0 %
	30	Diabetes with HbA1c 7.0–7.9 %
	20	Diabetes with HbA1c 8.0–8.9 %
	10	Diabetes with Hb A1c 9.0–9.9 %
	0	Diabetes with HbA1c ≥10.0 %
Blood pressure ^h	Points	Systolic and diastolic blood pressure
	100	<120/<80 mmHg
	75	120-129/<80 mmHg
	50	130-139 or 80-89 mmHg
	25	140-159 or 90-99 mmHg
	0	≥160 or ≥100 mmHg
If drug-treated, subtract 20 points		
Depression ⁱ	Points	PHQ-9 score
	100	0-4
	75	5-9
	50	10-14
	25	15-19
	0	20-27

Abbreviations: CVH, cardiovascular health; FBG, Fasting blood glucose; HbA1c, Hemoglobin A1c; DASH, Dietary Approaches to Stop Hypertension; HDL, high-density lipoprotein; Copyright © 2022 the American Heart Association, Inc.

*Life’s Essential 8 (LE8) comprises diet, physical activity, tobacco/nicotine exposure, sleep health, body mass index (BMI), blood lipid levels, blood glucose, and blood pressure. Life’s Crucial 9 (LC9) includes all components of LE8 and adds depression, assessed using the Patient Health Questionnaire-9 (PHQ-9).

^a Dietary intake was assessed through interviewer-administered 24-hour dietary recalls. The HEI-2015 is an updated measure of diet quality based on the 2015–2020 Dietary Guidelines for Americans. It consists of 13 components: nine adequacy components (total fruits, whole fruits, vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fluids) and four moderation components (refined grains, sodium, added sugars, and saturated fats). Each component is scored from 0 to 10, with higher scores indicating better adherence to dietary recommendations. The total HEI-2015 score ranges from 0 to 100, with higher scores reflecting healthier diets that align more closely with the guidelines.

^b Physical activity was assessed through self-reported weekly minutes of moderate or vigorous activity using a structured interview format. The classification was based on the recommended physical activity levels by the American Heart Association.

^c Smoking and tobacco exposure were determined through self-reported use of cigarettes, inhaled nicotine delivery systems (NDS), or secondhand smoke exposure. A point penalty was applied if the participant lived with an active indoor smoker.

^d Sleep duration was measured based on self-reported average hours of sleep per night. A more ideal sleep duration range (7-9 hours) was given the highest score.

^e BMI was measured during study visits using standardized procedures and calculated as weight (kg) divided by the square of height (m²). The BMI categories were aligned with standard clinical thresholds.

^f Total cholesterol and HDL cholesterol were measured using standard laboratory assays. Non-HDL cholesterol was calculated by subtracting HDL cholesterol from total cholesterol. Information on the use of lipid-lowering medications was obtained via self-report questionnaires.

^g FBG was measured using standard colorimetric methods, and HbA1c was determined by high-performance liquid chromatography. Information on diabetes treatment was collected through self-report questionnaires, and the scoring was adjusted accordingly if treatment was reported.

^h Blood pressure was measured using standardized procedures, and the average of all available readings was used to calculate systolic and diastolic blood pressure. Information regarding the use of antihypertensive medications was obtained via self-report questionnaires.

ⁱ The Patient Health Questionnaire-9 (PHQ-9) is a validated self-administered questionnaire used to screen, diagnose, and monitor the severity of depression. It consists of 9 items, each corresponding to one of the DSM-IV criteria for major depressive disorder. Participants rate the frequency of depressive symptoms over the past two weeks on a scale from 0 ("Not at all") to 3 ("Nearly every day"), resulting in a total score ranging from 0 to 27. Higher scores indicate greater severity of depressive symptoms, with thresholds commonly used to categorize depression as mild (5–9), moderate (10–14), moderately severe (15–19), or severe (20–27).

Table S3 Distribution of LS7 components across poor, intermediate, and ideal categories, and mean (standard error) of LE8 and LC9 components in NHANES 2013–2014 (n=22382).

	Numbers (percentages) of LS7 Component			Mean ± SE of LE8/LC9
	Poor	Intermediate	Ideal	Component
Diet	11443 (51.74)	10330 (45.42)	609 (2.84)	38.64 ± 0.44
Physical activity	0 (0.00)	7213 (30.58)	15168 (69.42)	73.22 ± 0.51
Tobacco/nicotine exposure	4536 (19.45)	4954 (23.17)	12885 (57.35)	71.72 ± 0.51
Body mass index	8607 (37.14)	7393 (32.96)	6382 (29.90)	60.63 ± 0.45
Blood lipids	2887 (13.15)	8781 (38.54)	10714 (48.32)	64.59 ± 0.36
Blood glucose	2193 (6.72)	5938 (21.71)	14251 (71.57)	88.02 ± 0.22
Blood pressure	3834 (14.28)	9705 (42.87)	8843 (42.85)	71.74 ± 0.37
Sleep health	NA	NA	NA	83.55 ± 0.27
Depression	NA	NA	NA	92.06 ± 0.19

Abbreviations: LS7: Life’s Simple 7; LE8: Life’s Essential 8 score; LC9, Life's Crucial 9. Components such as sleep health and depression, which are not part of LS7 classification, are reported only with their mean (standard error) values.

Table S4 Age- and sex-standardized mortality rates per 1000 person-years of all-cause and cause specific mortality by cardiovascular health score.

Cardiovascular Health Score	Standardized mortality rate per 1000 person-years (95% CI) *		
	All-Cause Mortality	CCD Mortality	CVD Mortality
Life's Simple 7 score			
≤4	16.57 (13.52-19.63)	4.42 (3.09-5.76)	3.92 (2.61-5.22)
5–6	9.03 (7.87-10.19)	2.28 (1.70-2.87)	1.84 (1.30-2.39)
7–8	6.85 (6.03-7.68)	1.80 (1.40-2.20)	1.58 (1.21-1.96)
9–10	5.23 (4.48-5.98)	1.48 (1.10-1.86)	1.14 (0.83-1.45)
≥11	4.06 (2.82-5.30)	1.14 (0.37-1.90)	1.12 (0.36-1.89)
Life’s Essential 8 score			
<50.0	12.99 (11.19-14.79)	3.49 (2.63-4.36)	3.06 (2.22-3.89)
50.0–59.9	9.18 (8.08-10.27)	2.37 (1.84-2.90)	1.89 (1.42-2.36)
60.0–69.9	6.75 (5.88-7.63)	1.95 (1.47-2.43)	1.67 (1.22-2.12)
70.0–79.9	5.15 (4.34-5.95)	1.33 (0.95-1.70)	1.04 (0.73-1.34)
>79.9	3.86 (2.95-4.76)	1.01 (0.53-1.49)	0.90 (0.44-1.36)
Life's Crucial 9 score			
<50.0	15.64 (13.07-18.22)	4.79 (3.39-6.18)	4.27 (2.91-5.63)
50.0–59.9	9.67 (8.37-10.98)	2.08 (1.54-2.62)	1.62 (1.14-2.09)
60.0–69.9	7.90 (6.95-8.86)	2.41 (1.88-2.93)	2.02 (1.52-2.51)
70.0–79.9	5.14 (4.41-5.87)	1.32 (0.98-1.67)	1.07 (0.78-1.37)
>79.9	4.01 (3.23-4.80)	0.99 (0.60-1.37)	0.89 (0.52-1.27)

Abbreviations: CCD, cardio-cerebrovascular disease; CVD, cardiovascular disease.

*Mortality rates were adjusted using the direct method of standardization, with the age and sex distribution of the entire cohort as the standard.

Table S5 Associations of the Life’s Simple 7 score with all-cause and cause specific mortality among adults in NHANES 2005–2018.

LS7	Crude		Model 1		Model 2	
	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value
All-Cause Mortality						
≤4	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
5–6	0.53 (0.44-0.65)	<0.001	0.54 (0.44-0.67)	<0.001	0.59 (0.48-0.73)	<0.001
7–8	0.34 (0.27-0.42)	<0.001	0.44 (0.35-0.55)	<0.001	0.50 (0.40-0.63)	<0.001
9–10	0.20 (0.16-0.25)	<0.001	0.34 (0.28-0.43)	<0.001	0.42 (0.33-0.52)	<0.001
≥11	0.09 (0.06-0.12)	<0.001	0.27 (0.19-0.38)	<0.001	0.35 (0.25-0.50)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 1 point increase	0.76 (0.73-0.78)	<0.001	0.85 (0.82-0.88)	<0.001	0.88 (0.85-0.91)	<0.001
Cardio–Cerebrovascular Mortality						
≤4	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
5–6	0.52 (0.35-0.78)	0.002	0.52 (0.35-0.77)	0.001	0.58 (0.39-0.86)	0.006
7–8	0.32 (0.22-0.48)	<0.001	0.43 (0.29-0.63)	<0.001	0.50 (0.34-0.73)	<0.001
9–10	0.19 (0.12-0.28)	<0.001	0.35 (0.24-0.53)	<0.001	0.44 (0.30-0.65)	<0.001
≥11	0.07 (0.03-0.14)	<0.001	0.26 (0.12-0.55)	<0.001	0.34 (0.16-0.73)	0.005
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 1 point increase	0.74 (0.70-0.78)	<0.001	0.85 (0.79-0.90)	<0.001	0.88 (0.82-0.93)	<0.001
Cardiovascular Mortality						
≤4	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
5–6	0.47 (0.30-0.74)	<0.001	0.47 (0.31-0.73)	<0.001	0.53 (0.34-0.82)	0.005
7–8	0.33 (0.21-0.51)	<0.001	0.43 (0.28-0.68)	<0.001	0.51 (0.34-0.79)	0.002
9–10	0.17 (0.11-0.26)	<0.001	0.32 (0.21-0.48)	<0.001	0.40 (0.27-0.61)	<0.001
≥11	0.07 (0.04-0.15)	<0.001	0.28 (0.13-0.61)	0.001	0.39 (0.18-0.85)	0.018
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 1 point increase	0.74 (0.69-0.78)	<0.001	0.84 (0.78-0.90)	<0.001	0.87 (0.81-0.93)	<0.001

Abbreviations: HR, hazard ratio; CI confidence interval; LS7: Life’s Simple 7. Model 1 was adjusted as age (continuous), sex (male or female), and race/ethnicity (non-Hispanic White, non-Hispanic Black or other race); Model 2 was adjusted as model 1 plus marital status (married/living with partner, or single/divorced/widowed), education level (below high school, high school, or above high school), family PIR (≤1.0, 1.1–3.0, or >3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).

Table S6 Associations of the Life’s Essential 8 score with all-cause and cause specific mortality among adults in NHANES 2005–2018.

LE8	Crude		Model 1		Model 2	
	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value
All-Cause Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.64 (0.53-0.77)	<0.001	0.71 (0.59-0.85)	<0.001	0.77 (0.64-0.93)	0.006
60.0–69.9	0.43 (0.35-0.54)	<0.001	0.52 (0.42-0.64)	<0.001	0.59 (0.47-0.73)	<0.001
70.0–79.9	0.28 (0.23-0.35)	<0.001	0.40 (0.33-0.50)	<0.001	0.49 (0.39-0.61)	<0.001
>79.9	0.15 (0.12-0.20)	<0.001	0.29 (0.22-0.39)	<0.001	0.38 (0.28-0.50)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.67 (0.64-0.70)	<0.001	0.75 (0.71-0.79)	<0.001	0.79 (0.75-0.83)	<0.001
Cardio–Cerebrovascular Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.64 (0.46-0.88)	0.006	0.70 (0.51-0.97)	0.032	0.78 (0.56-1.07)	0.121
60.0–69.9	0.46 (0.31-0.68)	<0.001	0.55 (0.37-0.82)	0.003	0.64 (0.43-0.95)	0.026
70.0–79.9	0.26 (0.19-0.36)	<0.001	0.39 (0.27-0.54)	<0.001	0.47 (0.34-0.67)	<0.001
>79.9	0.12 (0.06-0.21)	<0.001	0.25 (0.13-0.45)	<0.001	0.32 (0.17-0.60)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.65 (0.60-0.69)	<0.001	0.73 (0.67-0.79)	<0.001	0.78 (0.71-0.85)	<0.001
Cardiovascular Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.59 (0.40-0.87)	0.008	0.65 (0.44-0.95)	0.027	0.72 (0.49-1.05)	0.086
60.0–69.9	0.46 (0.30-0.69)	<0.001	0.55 (0.36-0.85)	0.006	0.65 (0.42-0.99)	0.043
70.0–79.9	0.24 (0.17-0.35)	<0.001	0.35 (0.24-0.52)	<0.001	0.44 (0.30-0.65)	<0.001
>79.9	0.12 (0.06-0.22)	<0.001	0.25 (0.13-0.47)	<0.001	0.34 (0.18-0.65)	0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.65 (0.60-0.70)	<0.001	0.73 (0.66-0.80)	<0.001	0.78 (0.71-0.86)	<0.001

Abbreviations: HR, hazard ratio; CI confidence interval; LE8: Life’s Essential 8 score. Model 1 was adjusted as age (continuous), sex (male or female), and race/ethnicity (non-Hispanic White, non-Hispanic Black or other race); Model 2 was adjusted as model 1 plus marital status (married/living with partner, or single/divorced/widowed), education level (below high school, high school, or above high school), family PIR (≤1.0, 1.1–3.0, or >3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).

Table S7 Associations of the Life's Crucial 9 score with all-cause and cause specific mortality among adults in NHANES 2005–2018.

LC9	Crude		Model 1		Model 2	
	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value
All-Cause Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.62 (0.51-0.76)	<0.001	0.60 (0.49-0.73)	<0.001	0.65 (0.53-0.79)	<0.001
60.0–69.9	0.46 (0.37-0.57)	<0.001	0.49 (0.40-0.60)	<0.001	0.57 (0.46-0.69)	<0.001
70.0–79.9	0.27 (0.22-0.32)	<0.001	0.32 (0.26-0.40)	<0.001	0.39 (0.32-0.48)	<0.001
>79.9	0.14 (0.11-0.19)	<0.001	0.24 (0.18-0.31)	<0.001	0.32 (0.24-0.42)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.65 (0.62-0.68)	<0.001	0.72 (0.68-0.75)	<0.001	0.76 (0.72-0.81)	<0.001
Cardio–Cerebrovascular Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.47 (0.32-0.71)	<0.001	0.43 (0.29-0.65)	<0.001	0.47 (0.32-0.71)	<0.001
60.0–69.9	0.48 (0.32-0.72)	<0.001	0.49 (0.33-0.73)	<0.001	0.58 (0.39-0.86)	0.007
70.0–79.9	0.23 (0.16-0.32)	<0.001	0.27 (0.19-0.39)	<0.001	0.33 (0.23-0.47)	<0.001
>79.9	0.10 (0.06-0.17)	<0.001	0.18 (0.10-0.30)	<0.001	0.24 (0.14-0.42)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.63 (0.59-0.68)	<0.001	0.69 (0.63-0.76)	<0.001	0.74 (0.68-0.82)	<0.001
Cardiovascular Mortality						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.41 (0.26-0.64)	<0.001	0.38 (0.24-0.59)	<0.001	0.42 (0.27-0.65)	<0.001
60.0–69.9	0.45 (0.28-0.72)	<0.001	0.47 (0.29-0.74)	0.001	0.56 (0.36-0.88)	0.012
70.0–79.9	0.21 (0.14-0.30)	<0.001	0.25 (0.17-0.36)	<0.001	0.31 (0.21-0.45)	<0.001
>79.9	0.10 (0.06-0.17)	<0.001	0.17 (0.10-0.31)	<0.001	0.25 (0.14-0.44)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.63 (0.58-0.68)	<0.001	0.69 (0.63-0.77)	<0.001	0.75 (0.68-0.83)	<0.001

Abbreviations: HR, hazard ratio; CI confidence interval; LC9, Life's Crucial 9. Model 1 was adjusted as age (continuous), sex (male or female), and race/ethnicity (non-Hispanic White, non-Hispanic Black or other race); Model 2 was adjusted as model 1 plus marital status (married/living with partner, or single/divorced/widowed), education level (below high school, high school, or above high school), family PIR (≤1.0, 1.1–3.0, or >3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).

Table S8 Associations of the cardiovascular health score with all-cause and cause specific mortality among adults after excluding participants who died within two years of follow-up in NHANES 2005–2018 (n=22168).

	All-Cause Mortality		CCD Mortality		CVD Mortality	
	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value
Life's Simple 7 score						
≤4	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
5–6	0.65 (0.52-0.82)	<0.001	0.51 (0.34-0.77)	0.002	0.44 (0.28-0.70)	<0.001
7–8	0.54 (0.42-0.69)	<0.001	0.47 (0.31-0.71)	<0.001	0.49 (0.32-0.78)	0.002
9–10	0.44 (0.35-0.56)	<0.001	0.42 (0.28-0.63)	<0.001	0.37 (0.24-0.57)	<0.001
≥11	0.37 (0.25-0.55)	<0.001	0.28 (0.13-0.61)	<0.001	0.32 (0.14-0.71)	0.005
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 1 point increase	0.88 (0.85-0.91)	<0.001	0.87 (0.81-0.93)	<0.001	0.86 (0.80-0.93)	<0.001
Life’s Essential 8 score						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.83 (0.68-1.00)	0.051	0.75 (0.53-1.06)	0.105	0.69 (0.46-1.04)	0.076
60.0–69.9	0.59 (0.46-0.75)	<0.001	0.56 (0.37-0.83)	0.004	0.56 (0.37-0.87)	0.009
70.0–79.9	0.51 (0.40-0.65)	<0.001	0.48 (0.34-0.69)	<0.001	0.45 (0.30-0.67)	<0.001
>79.9	0.40 (0.29-0.56)	<0.001	0.29 (0.15-0.55)	<0.001	0.30 (0.15-0.59)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.80 (0.76-0.85)	<0.001	0.76 (0.70-0.83)	<0.001	0.76 (0.70-0.84)	<0.001
Life's Crucial 9 score						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.69 (0.55-0.87)	0.002	0.47 (0.31-0.73)	<0.001	0.42 (0.26-0.66)	<0.001
60.0–69.9	0.59 (0.47-0.74)	<0.001	0.53 (0.35-0.81)	0.003	0.51 (0.31-0.84)	0.007
70.0–79.9	0.42 (0.34-0.53)	<0.001	0.34 (0.24-0.49)	<0.001	0.31 (0.21-0.47)	<0.001
>79.9	0.33 (0.24-0.46)	<0.001	0.23 (0.13-0.40)	<0.001	0.23 (0.13-0.42)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.78 (0.73-0.82)	<0.001	0.74 (0.67-0.81)	<0.001	0.74 (0.67-0.82)	<0.001

Abbreviations: HR, hazard ratio; CI confidence interval; CCD, cardio-cerebrovascular disease; CVD, cardiovascular disease. Analyses was adjusted as age (continuous), sex (male or female), race/ethnicity (non-Hispanic White, non-Hispanic Black or other race), marital status (married/living with partner, or single/divorced/widowed), education level (below high school, high school, or above high school), family PIR (≤1.0, 1.1–3.0, or >3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).

Table S9 Associations of the cardiovascular health score with all-cause and cause specific mortality among participants with data on all 9 components of the LC9 at baseline (instead of at least 8, as in the primary analysis) in NHANES 2005–2018 (n=21005).

	All-Cause Mortality		CCD Mortality		CVD Mortality	
	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value	HR (95% CI)	<i>P</i> value
Life's Simple 7 score						
≤4	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
5–6	0.61 (0.49-0.76)	<0.001	0.53 (0.36-0.80)	0.003	0.46 (0.29-0.73)	0.001
7–8	0.52 (0.41-0.67)	<0.001	0.45 (0.30-0.68)	<0.001	0.45 (0.28-0.72)	<0.001
9–10	0.44 (0.34-0.56)	<0.001	0.40 (0.27-0.58)	<0.001	0.35 (0.23-0.53)	<0.001
≥11	0.38 (0.27-0.54)	<0.001	0.32 (0.15-0.69)	0.004	0.36 (0.16-0.79)	0.011
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 1 point increase	0.89 (0.86-0.92)	<0.001	0.87 (0.81-0.93)	<0.001	0.86 (0.80-0.93)	<0.001
Life’s Essential 8 score						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.79 (0.65-0.97)	0.027	0.75 (0.53-1.07)	0.115	0.67 (0.44-1.01)	0.058
60.0–69.9	0.60 (0.47-0.76)	<0.001	0.59 (0.39-0.89)	0.012	0.58 (0.37-0.90)	0.015
70.0–79.9	0.51 (0.39-0.66)	<0.001	0.45 (0.32-0.65)	<0.001	0.41 (0.28-0.61)	<0.001
>79.9	0.40 (0.30-0.54)	<0.001	0.32 (0.17-0.61)	<0.001	0.33 (0.17-0.65)	0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.81 (0.76-0.85)	<0.001	0.77 (0.70-0.84)	<0.001	0.77 (0.70-0.84)	<0.001
Life's Crucial 9 score						
<50.0	1.00 [Reference]		1.00 [Reference]		1.00 [Reference]	
50.0–59.9	0.65 (0.52-0.81)	<0.001	0.45 (0.29-0.68)	<0.001	0.37 (0.24-0.59)	<0.001
60.0–69.9	0.58 (0.46-0.72)	<0.001	0.54 (0.36-0.81)	0.003	0.51 (0.32-0.80)	0.004
70.0–79.9	0.40 (0.31-0.51)	<0.001	0.30 (0.21-0.42)	<0.001	0.26 (0.18-0.38)	<0.001
>79.9	0.33 (0.25-0.44)	<0.001	0.23 (0.13-0.40)	<0.001	0.23 (0.13-0.41)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001
Per 10 points increase	0.77 (0.73-0.82)	<0.001	0.73 (0.66-0.81)	<0.001	0.73 (0.66-0.81)	<0.001

Abbreviations: HR, hazard ratio; CI confidence interval; CCD, cardio-cerebrovascular disease; CVD, cardiovascular disease. Analyses was adjusted as age (continuous), sex (male or female), race/ethnicity (non-Hispanic White, non-Hispanic Black or other race), marital status (married/living with partner, or single/divorced/widowed), education level (below high school, high school, or above high school), family PIR (≤1.0, 1.1–3.0, or >3.0), and drinking status (nondrinker, low-to-moderate drinker, or heavy drinker).