

Supplementary Table S1. Life's Essential 8 scoring rules

Domain	CVH metric	Method of measurement	Quantification of CVH metric																
Health behaviors	Diet	Dietary intake data were collected from NHANES participants through up to two 24-hour dietary recalls, in person during the first recall and by telephone during the second recall 3-10 days later. Applying HEI-2015 to Evaluate Dietary Quality(Table S1).	<table> <tr> <td>Points:</td> <td>HEI-2015 score:</td> </tr> <tr> <td>100</td> <td>≥ 95th percentiles</td> </tr> <tr> <td>80</td> <td>75th-94th percentiles</td> </tr> <tr> <td>50</td> <td>50th-74th percentiles</td> </tr> <tr> <td>25</td> <td>25th-49th percentiles</td> </tr> <tr> <td>0</td> <td>1st-24th percentiles</td> </tr> </table>	Points:	HEI-2015 score:	100	≥ 95th percentiles	80	75th-94th percentiles	50	50th-74th percentiles	25	25th-49th percentiles	0	1st-24th percentiles				
	Points:	HEI-2015 score:																	
	100	≥ 95th percentiles																	
80	75th-94th percentiles																		
50	50th-74th percentiles																		
25	25th-49th percentiles																		
0	1st-24th percentiles																		
	Physical activity	Self-reported minutes of moderate or vigorous PA per week	<table> <tr> <td>Points:</td> <td>Minutes:</td> </tr> <tr> <td>100</td> <td>≥ 150</td> </tr> <tr> <td>90</td> <td>120–149</td> </tr> <tr> <td>80</td> <td>90–119</td> </tr> <tr> <td>60</td> <td>60–89</td> </tr> <tr> <td>40</td> <td>30–59</td> </tr> <tr> <td>20</td> <td>1–29</td> </tr> <tr> <td>0</td> <td>0</td> </tr> </table>	Points:	Minutes:	100	≥ 150	90	120–149	80	90–119	60	60–89	40	30–59	20	1–29	0	0
Points:	Minutes:																		
100	≥ 150																		
90	120–149																		
80	90–119																		
60	60–89																		
40	30–59																		
20	1–29																		
0	0																		
	Nicotine exposure	Self-reported smoking status	<table> <tr> <td>Points:</td> <td>Smoking status:</td> </tr> <tr> <td>100</td> <td>Never smoker</td> </tr> <tr> <td>75</td> <td>Former smoker, quit ≥ 5 y</td> </tr> <tr> <td>50</td> <td>Former smoker, 1–< 5 y</td> </tr> <tr> <td>25</td> <td>Former smoker, quit < 1 y, or currently using inhaled NDS</td> </tr> <tr> <td>0</td> <td>Current smoker</td> </tr> </table>	Points:	Smoking status:	100	Never smoker	75	Former smoker, quit ≥ 5 y	50	Former smoker, 1–< 5 y	25	Former smoker, quit < 1 y, or currently using inhaled NDS	0	Current smoker				
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0	Current smoker																		
			Subtract 20 points (unless score is 0) for living with active																

			indoor smoker in home														
	Sleep health	Self-reported average hours of sleep per night	<table> <tr> <td>Points:</td> <td>Level (hours)</td> </tr> <tr> <td>100</td> <td>7–< 9</td> </tr> <tr> <td>90</td> <td>9–< 10</td> </tr> <tr> <td>70</td> <td>6–< 7</td> </tr> <tr> <td>40</td> <td>5–< 6 or ≥ 10</td> </tr> <tr> <td>20</td> <td>4–< 5</td> </tr> <tr> <td>0</td> <td>< 4</td> </tr> </table>	Points:	Level (hours)	100	7–< 9	90	9–< 10	70	6–< 7	40	5–< 6 or ≥ 10	20	4–< 5	0	< 4
Points:	Level (hours)																
100	7–< 9																
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0	< 4																
Health factors	BMI	Body weight (kilograms) divided by height squared (meters squared), and then compare the BMI with the specific values of the same age and sex in the reference table.	<table> <tr> <td>Points:</td> <td>BMI [kg/m²]</td> </tr> <tr> <td>100</td> <td>< 25</td> </tr> <tr> <td>70</td> <td>25.0–29.9</td> </tr> <tr> <td>30</td> <td>30.0–34.9</td> </tr> <tr> <td>15</td> <td>35.0–39.9</td> </tr> <tr> <td>0</td> <td>≥ 40.0</td> </tr> </table>	Points:	BMI [kg/m ²]	100	< 25	70	25.0–29.9	30	30.0–34.9	15	35.0–39.9	0	≥ 40.0		
	Points:	BMI [kg/m ²]															
	100	< 25															
70	25.0–29.9																
30	30.0–34.9																
15	35.0–39.9																
0	≥ 40.0																
Blood lipids	Plasma total and HDL cholesterol with calculation of non-HDL cholesterol	<table> <tr> <td>Points:</td> <td>Non-HDL cholesterol [mg/dl]</td> </tr> <tr> <td>100</td> <td>< 130</td> </tr> <tr> <td>60</td> <td>130–159</td> </tr> <tr> <td>40</td> <td>160–189</td> </tr> <tr> <td>20</td> <td>190–219</td> </tr> <tr> <td>0</td> <td>≥ 220</td> </tr> </table> <p>If drug-treated level, subtract 20 points (unless score is 0)</p>	Points:	Non-HDL cholesterol [mg/dl]	100	< 130	60	130–159	40	160–189	20	190–219	0	≥ 220			
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100	< 130																
60	130–159																
40	160–189																
20	190–219																
0	≥ 220																
Blood glucose	Measured fasting blood glucose, HbA1c, and asked participants about their history of diabetes.	<table> <tr> <td>Points:</td> <td>Level:</td> </tr> <tr> <td>100</td> <td>No history of T2D and HbA1c < 5.7</td> </tr> <tr> <td>60</td> <td>No T2D and HbA1c 5.7–6.4</td> </tr> <tr> <td>40</td> <td>T2D with HbA1c < 7.0</td> </tr> <tr> <td>30</td> <td>T2D with HbA1c 7.0–7.9</td> </tr> <tr> <td>20</td> <td>T2D with HbA1c 8.0–8.9</td> </tr> <tr> <td>10</td> <td>T2D with Hb A1c 9.0–9.9</td> </tr> </table>	Points:	Level:	100	No history of T2D and HbA1c < 5.7	60	No T2D and HbA1c 5.7–6.4	40	T2D with HbA1c < 7.0	30	T2D with HbA1c 7.0–7.9	20	T2D with HbA1c 8.0–8.9	10	T2D with Hb A1c 9.0–9.9	
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			0	T2D with HbA1c \geq 10.0
	Blood pressure	Appropriately measured systolic and diastolic BPs	Points:	Systolic and diastolic BPs [mm Hg]
			100	< 120/< 80
			75	120–129/< 80
			50	130–139 or 80–89
			25	140–159 or 90–99
			0	\geq 160 or \geq 100
	If drug-treated level, subtract 20 points (unless score is 0)			

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Supplementary Table SII. Association between body mass index at age 25 years and at 10 years before the baseline and CVH scores

Variable	N	Univariate model		Multivariate model	
		β (95% CI)	P-value	β (95% CI)	P-value
At age 25 years					
Continuous, per 1 kg/m ²	1257	-0.08 (-0.18–0.01)	0.087	-0.06 (-0.16–0.03)	0.18
BMI Categories					
Normal weight	828	0 (Ref)		0 (Ref)	
Underweight	71	0.35 (-2.58–3.29)	0.813	0.31 (-2.54–3.15)	0.833
Overweight	277	-1.41 (-3.06–0.24)	0.094	-0.88 (-2.52–0.76)	0.295
Obesity	81	-5.8 (-8.57–-3.04)	< 0.001	-4.71 (-7.39–-2.03)	0.001
At 10 years before baseline					
Continuous, per 1 kg/m ²	1257	-0.08 (-0.18–0.01)	0.087	-0.06 (-0.16–0.03)	0.18
BMI Categories					
Normal weight	360	0 (Ref)		0 (Ref)	
Underweight	15	5.49 (-0.64–11.62)	0.08	5.3 (-0.63–11.23)	0.08
Overweight	480	-1.56 (-3.18–0.06)	0.059	-2.22 (-3.81–0.63)	0.006
Obesity	402	-6.46 (-8.15–-4.77)	< 0.001	-6.56 (-8.22–-4.9)	< 0.001

Supplementary Table SIII. Association between weight change patterns and CVH scores

Parameter	Stable	Weight loss, β	Weight gain, β	Stable obese, β
	non-obese	(95% CI)	(95% CI)	(95% CI)
From age 25 years to baseline				
Model 1	0 (Ref)	-6.61 (-11.52–1.7)*	-9.45 (-10.82–8.08)*	-9.43 (-12.4–6.45)*
Model 2	0 (Ref)	-5.12 (-9.88–0.35)*	-9.13 (-10.47–7.79)*	-8.7 (-11.57–5.82)*
From age 25 years to 10 years before baseline				
Model 1	0(Ref)	-5.98 (-13.05–1.1)	-5.46 (-6.97–3.95)*	-7.2 (-10.1–4.3)*
Model 2	0(Ref)	-5.85 (-12.7–1.01)	-5.29 (-6.76–3.82)*	-6.1 (-8.91–3.29)*
From 10 years before baseline to baseline				
Model 1	0 (Ref)	-5.49 (-11.62–0.64)	-7.05 (-13.16–0.95)*	-11.95 (-18.08–5.83)*
Model 2	0 (Ref)	-5.3 (-11.23–0.63)	-7.52 (-13.44–1.6)*	-11.86 (-17.8–5.91)*

Supplementary Table SIV. Association between uric acid and CVH scores

Variable	<i>N</i>	Univariate model		Multivariate model	
		β (95% CI)	<i>P</i> -value	β (95% CI)	<i>P</i> -value
Continuous, per 1 mg/dl	1257	-1.15 (-1.62–0.67)	< 0.001	-1.24 (-1.73–0.74)	< 0.001
Uric acid quartiles					
Quartile 1	288	0 (Ref)		0 (Ref)	
Quartile 2	322	0.28 (-1.63–2.2)	0.773	0.32 (-1.55–2.2)	0.736
Quartile 3	304	-3.12 (-5.06–1.17)	0.002	-3.36 (-5.3–1.42)	0.001
Quartile 4	343	-3.95 (-5.84–2.06)	< 0.001	-4.2 (-6.14–2.27)	< 0.001

Supplementary Table SV. Association between absolute weight change and uric acid

Variable	N	Univariate model		Multivariate model	
		β (95% CI)	P-value	β (95% CI)	P-value
From age 25 years to baseline					
Continuous, per 1 kg	1257	0.01 (0.01–0.02)	< 0.001	0.02 (0.01–0.02)	< 0.001
Categories of absolute weight change, kg					
Loss \geq 2.5	155	-0.01 (-0.34–0.32)	0.949	-0.1 (-0.4–0.2)	0.526
Change < 2.5 (ref)	127	0 (Ref)		0 (Ref)	
Gain 2.5-< 10.0	260	0.19 (-0.11–0.48)	0.217	0.31 (0.04–0.58)	0.026
Gain 10-< 20.0	346	0.31 (0.03–0.6)	0.03	0.48 (0.22–0.74)	< 0.001
Gain \geq 20.0	369	0.51 (0.23–0.8)	< 0.001	0.79 (0.53–1.05)	< 0.001
From age 25 years to 10 years before baseline					
Continuous, per 1 kg	1257	0.01 (0–0.02)	< 0.001	0.01 (0.01–0.02)	< 0.001
Categories of absolute weight change [kg]					
Loss \geq 2.5	78	-0.22 (-0.57–0.14)	0.234	-0.23 (-0.56–0.1)	0.178
Change < 2.5 (ref)	252	0 (Ref)		0 (Ref)	
Gain 2.5-< 10.0	332	0.19 (-0.04–0.42)	0.103	0.25 (0.04–0.46)	0.022
Gain 10-< 20.0	316	0.29 (0.06–0.52)	0.013	0.3 (0.08–0.52)	0.007
Gain \geq 20.0	279	0.48 (0.25–0.72)	< 0.001	0.55 (0.33–0.77)	< 0.001
From 10 years before baseline to baseline					
Continuous, per 1 kg	1257	0 (0–0.01)	0.282	0.01 (0–0.01)	0.001
Categories of absolute weight change [kg]					

Loss ≥ 2.5	424	0.23 (0.02–0.44)	0.033	0.16 (-0.04–0.36)	0.108
Change < 2.5 (ref)	277	0 (Ref)		0 (Ref)	
Gain 2.5-< 10.0	309	0.26 (0.03–0.49)	0.025	0.42 (0.21–0.63)	< 0.001
Gain 10-< 20.0	159	0.2 (-0.07–0.48)	0.15	0.45 (0.19–0.71)	0.001
Gain ≥ 20.0	88	0.51 (0.18–0.85)	0.003	0.85 (0.53–1.17)	< 0.001

Supplementary Table SVI. Association between body mass index and uric acid

Variable	N	Univariate model		Multivariate model	
		β (95% CI)	P-value	β (95% CI)	P-value
At age 25 years					
Continuous, per 1 kg/m ²	1257	0.02 (0.01–0.03)	< 0.001	0.01 (0–0.02)	0.062
BMI Categories					
Normal weight	828	0 (Ref)		0 (Ref)	
Underweight	71	-0.33 (-0.67–0)	0.054	-0.11 (-0.43–0.2)	0.484
Overweight	277	0.49 (0.3–0.68)	< 0.001	0.23 (0.05–0.41)	0.014
Obesity	81	0.53 (0.21–0.85)	0.001	0.46 (0.16–0.76)	0.003
At 10 years before baseline					
Continuous, per 1 kg/m ²	1257	0.04 (0.03–0.05)	< 0.001	0.04 (0.02–0.05)	< 0.001
BMI Categories					
Normal weight	360	0 (Ref)		0 (Ref)	
Underweight	15	-0.47 (-1.18–0.24)	0.197	-0.16 (-0.83–0.51)	0.642
Overweight	480	0.66 (0.47–0.84)	< 0.001	0.49 (0.31–0.67)	< 0.001
Obesity	402	0.68 (0.48–0.87)	< 0.001	0.55 (0.36–0.73)	< 0.001
At baseline					
Continuous, per 1 kg/m ²	1257	0.05 (0.04–0.06)	< 0.001	0.06 (0.04–0.07)	< 0.001
BMI Categories					
Normal weight	360	0 (Ref)		0 (Ref)	
Underweight	15	-0.62 (-1.36–0.12)	0.1	-0.44 (-1.13–0.24)	0.206
Overweight	480	0.52 (0.32–0.72)	< 0.001	0.47 (0.28–0.65)	< 0.001
Obesity	402	0.75 (0.55–0.96)	< 0.001	0.81 (0.62–0.99)	< 0.001

Supplementary Table SVII. Association between weight change patterns and uric acid

Variable	Stable non-obese	Weight loss, β (95% CI)	Weight gain, β (95% CI)	Stable obese, β (95% CI)
From age 25 years to baseline				
Model 1	0 (Ref)	0.53 (-0.07–1.14)	0.44 (0.27–0.6)*	0.6 (0.24–0.97)*
Model 2	0 (Ref)	0.3 (-0.26–0.86)	0.52 (0.36–0.67)*	0.69 (0.35–1.03)*
From age 25 years to 10 years before baseline				
Model 1	0 (Ref)	0.1 (-0.73–0.94)	0.27 (0.09–0.44)*	0.58 (0.23–0.92)*
Model 2	0 (Ref)	0.24 (-0.54–1.01)	0.22 (0.05–0.39)*	0.51 (0.19–0.82)*
From 10 years before baseline to baseline				
Model 1	0(Ref)	0.26 (-0.02–0.53)	0.48 (0.25–0.71)*	0.48 (0.29–0.68)*
Model 2	0(Ref)	0.18 (-0.07–0.43)	0.66 (0.44–0.87)*	0.5 (0.32–0.68)*

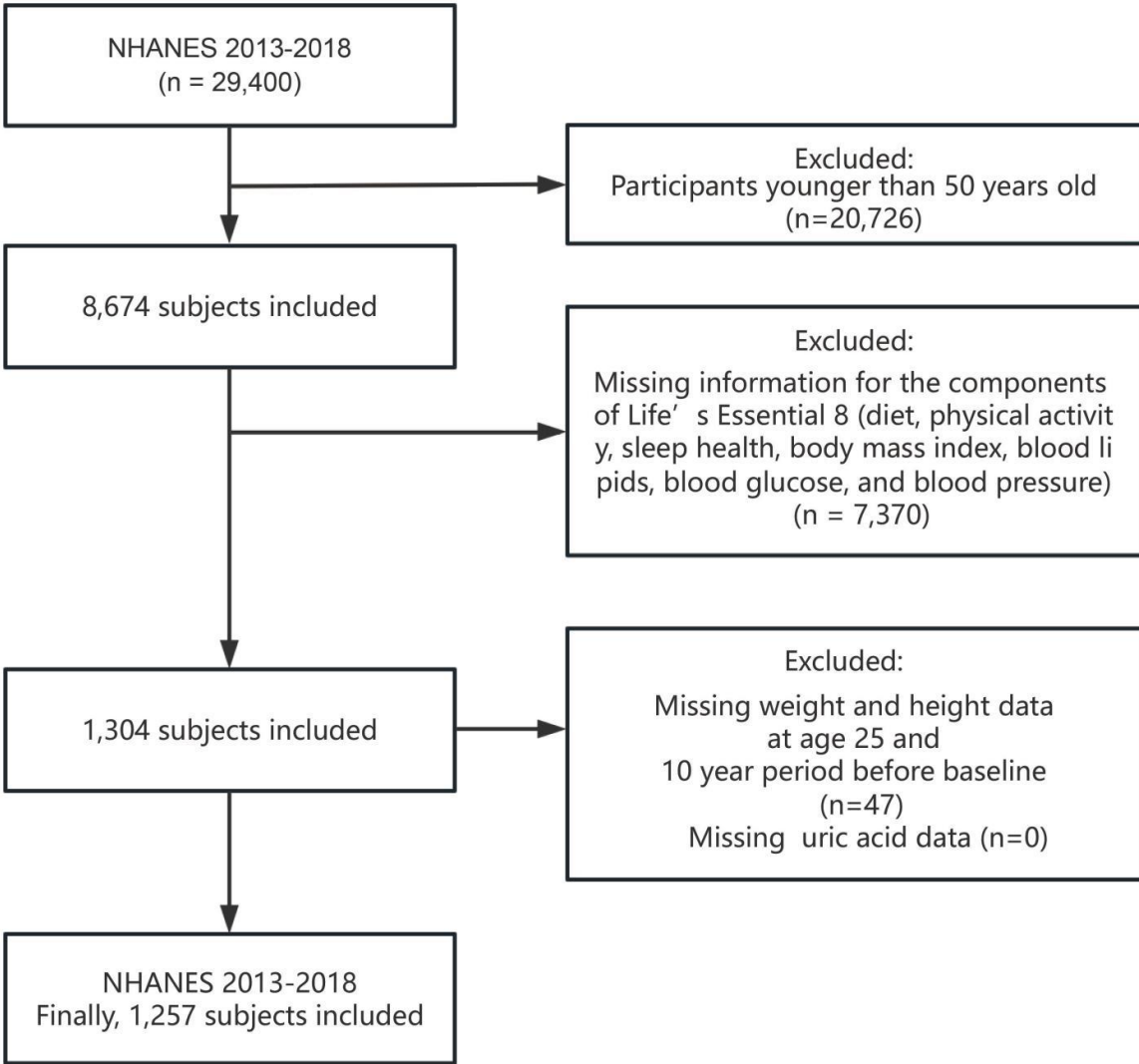
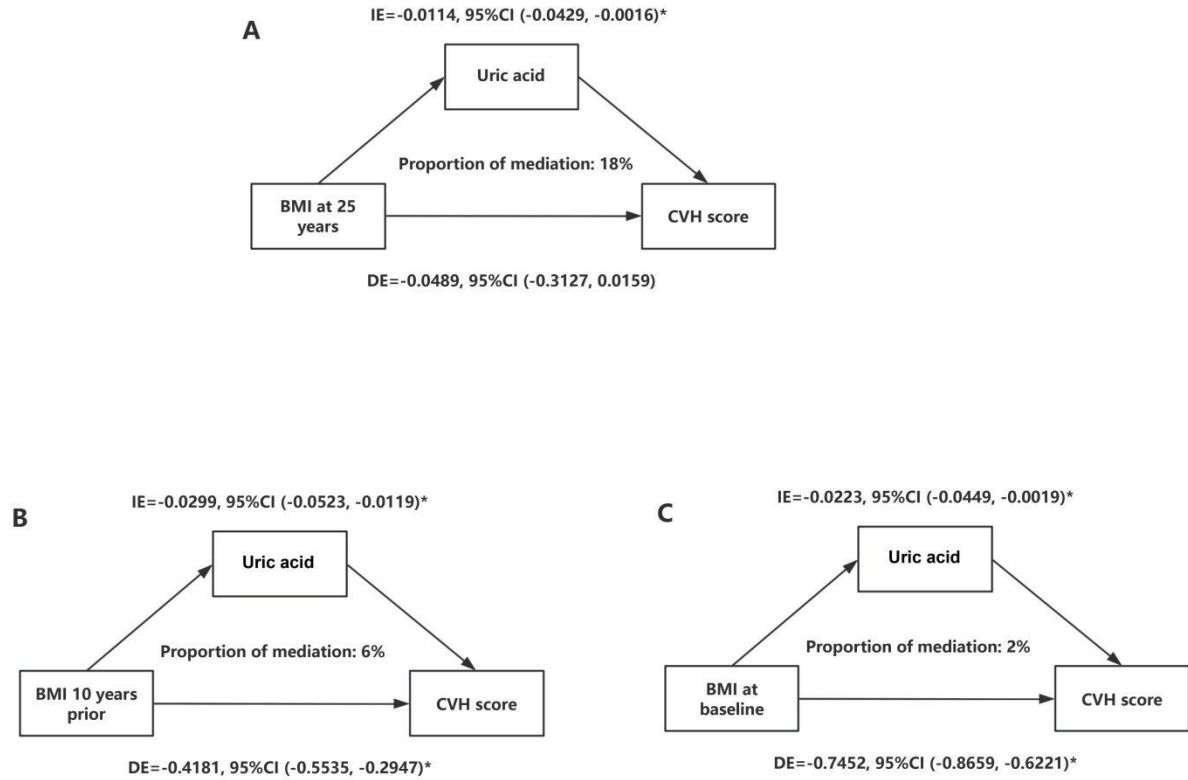
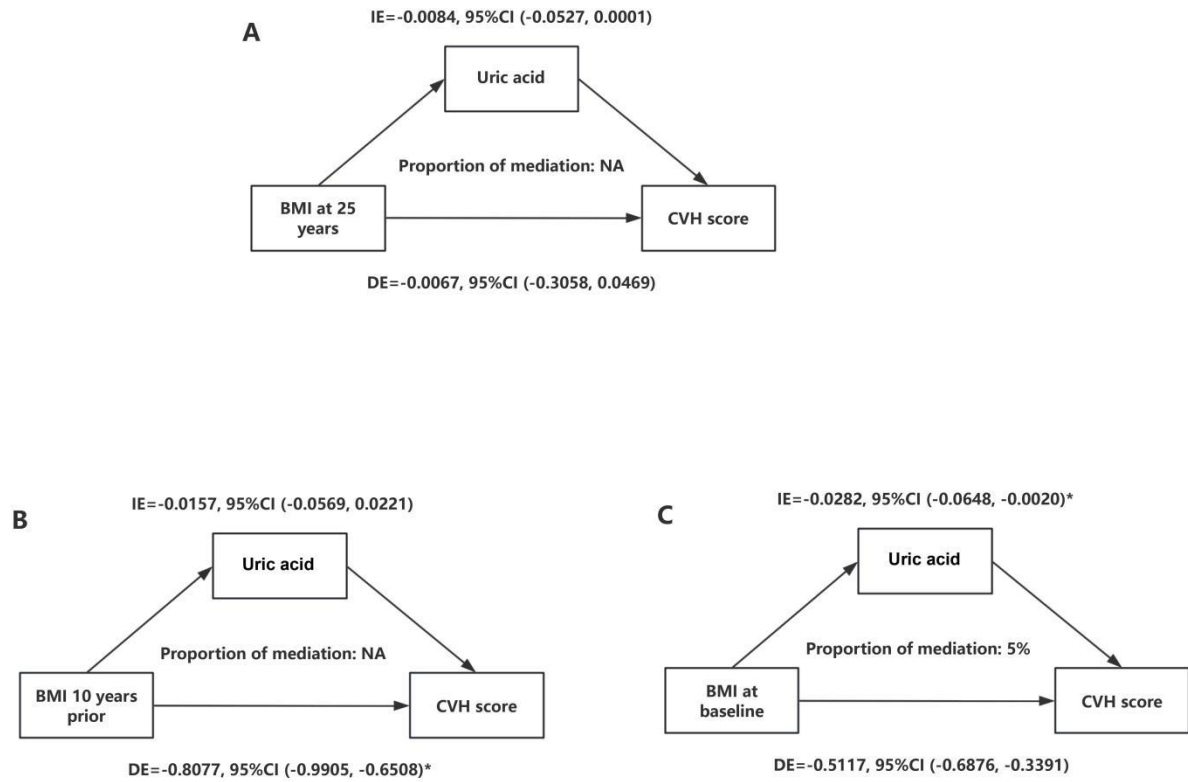


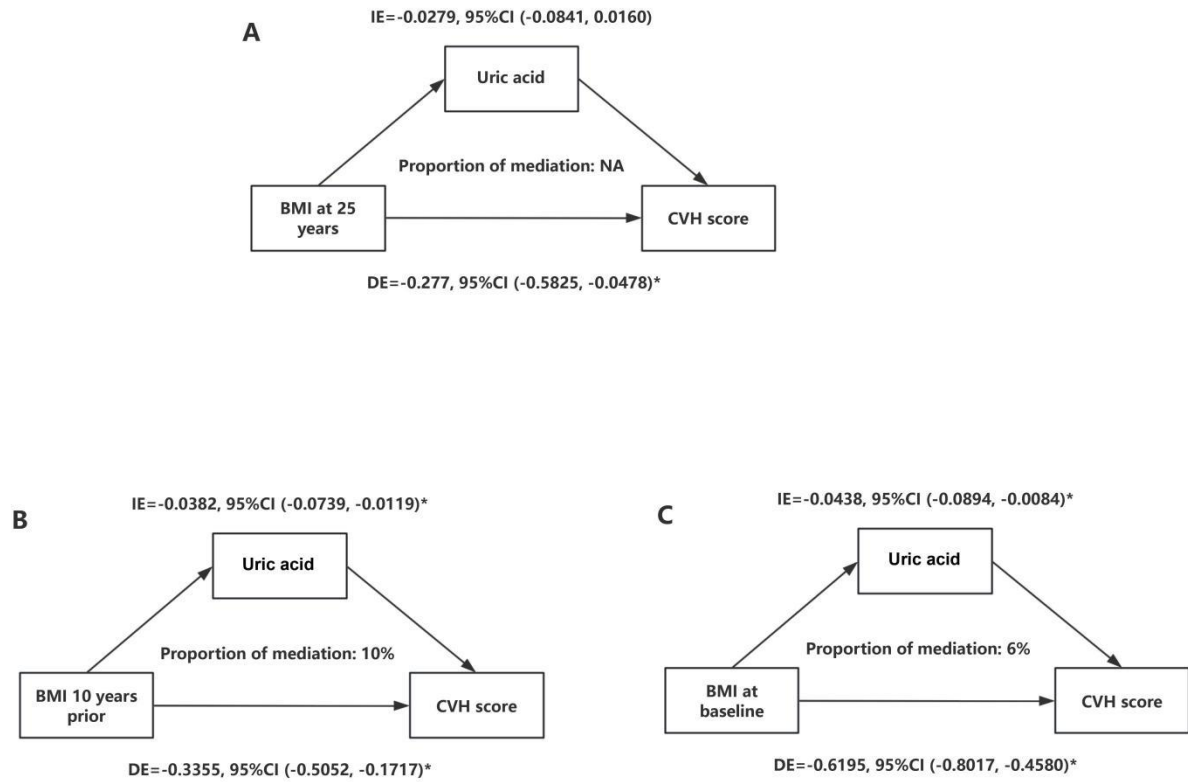
Fig. S1 The study' s flow diagram



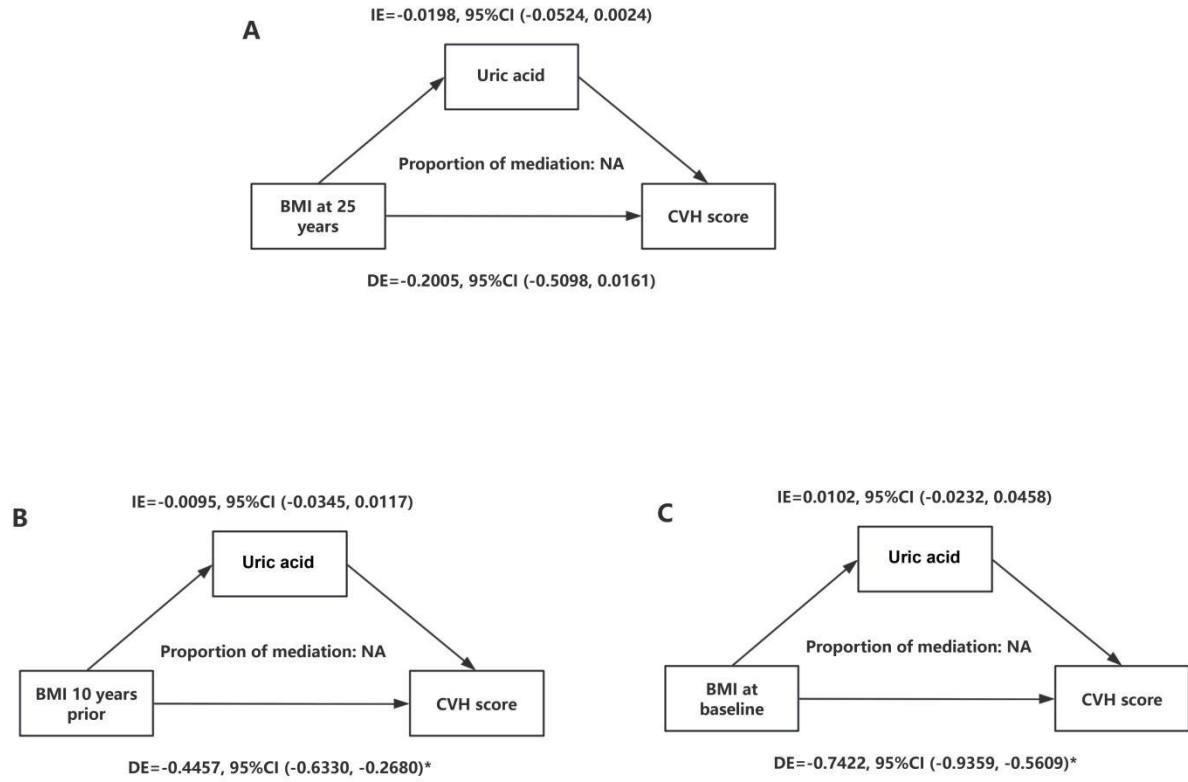
Supplementary Figure S2. Uric acid as a mediator of the relationship between BMI at different life stages and CVH after adjusting for cardiovascular disease history. Mediation analysis by the bootstrap test: adjusted for age, sex, race, family PIR, educational level, marital status, drinking status and cardiovascular disease history. IE – indirect effect; DE – direct effect. * $P < 0.05$



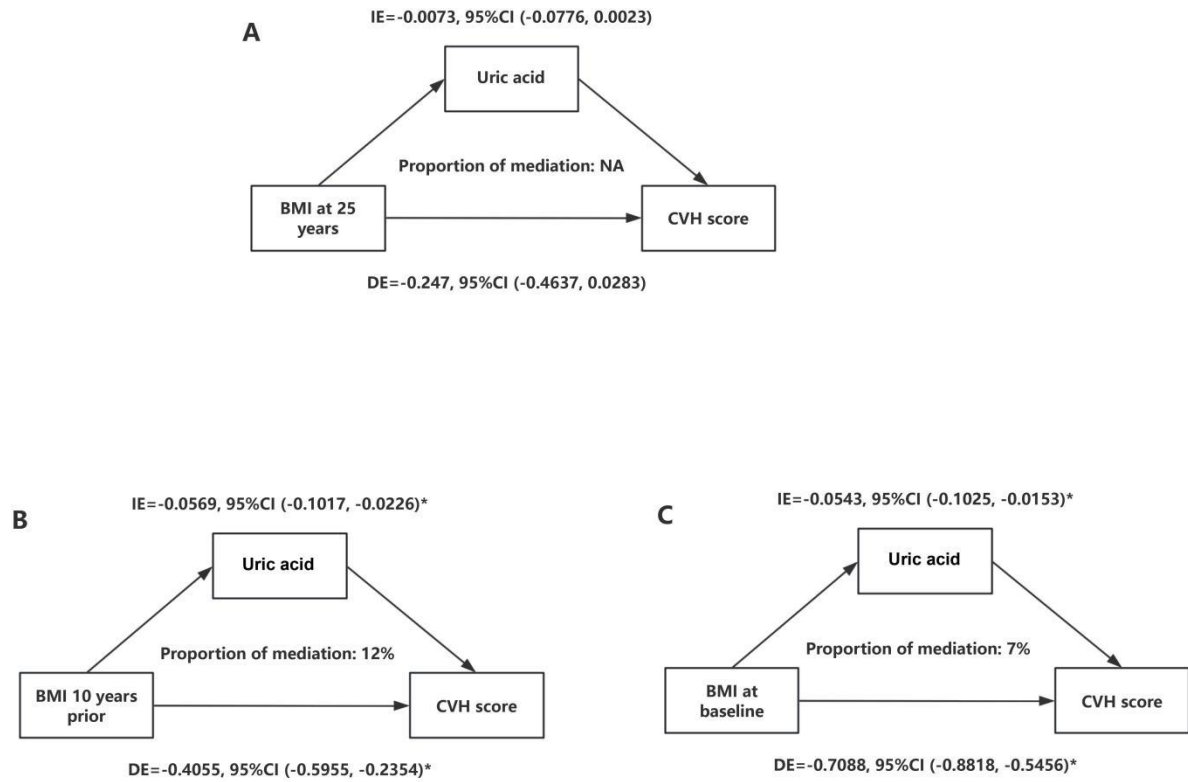
Supplementary Figure S3. Uric acid as a mediator of the relationship between BMI at different life stages and CVH in males. Mediation analysis by the bootstrap test: adjusted for age, race, family PIR, educational level, marital status, drinking status. IE – indirect effect; DE – direct effect. * $P < 0.05$



Supplementary Figure S4. Uric acid as a mediator of the relationship between BMI at different life stages and CVH in females. Mediation analysis by the bootstrap test: adjusted for age, race, family PIR, educational level, marital status, drinking status. IE – indirect effect; DE – direct effect. * $P < 0.05$



Supplementary Figure S5. Uric acid as a mediator of the relationship between BMI at different life stages and CVH younger than 65 years. Mediation analysis by the bootstrap test: adjusted for sex, race, family PIR, educational level, marital status, drinking status. IE – indirect effect; DE – direct effect. * $P < 0.05$



Supplementary Figure S6. Uric acid as a mediator of the relationship between BMI at different life stages and CVH aged 65 years or older. Mediation analysis by the bootstrap test: adjusted for sex, race, family PIR, educational level, marital status, drinking status. IE – indirect effect; DE – direct effect. * $P < 0.05$