American Heart Association's Life's Simple 7 at Middle Age and Prognosis After Myocardial Infarction in Later Life

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Background—The American Heart Association recommends focusing on 7 health factors (Life's Simple 7) for primordial prevention of cardiovascular health. However, whether greater adherence to Life's Simple 7 in midlife improves prognosis after myocardial infarction (MI) in later life is unknown.

Methods and Results—In 1277 participants who developed MI during the ARIC (Atherosclerosis Risk in Communities) Study follow-up, a 14-point score of Life's Simple 7 was constructed according to the status (2 points for ideal, 1 point for intermediate, and 0 points for poor) of each of 7 factors (smoking, adiposity, physical activity, diet, total cholesterol, blood pressure, and fasting glucose) at baseline (1987–1989). Hazard ratios for composite and individual adverse outcomes of all-cause mortality, cardiovascular mortality, recurrent MI, heart failure, and stroke were calculated according to Life's Simple 7 score. During a median follow-up of 3.3 years, 918 participants (72%) had subsequent adverse outcomes after MI. Life's Simple 7 score at middle age was inversely associated with adverse outcomes after MI (adjusted hazard ratios of composite outcome, 0.57 [95% confidence interval, 0.39–0.84] if score is ≥10, 0.78 [95% confidence interval, 0.57–1.07] if score is 7–9, and 0.82 [95% confidence interval, 0.60–1.11] if score is 4–6 versus ≤3). The association was largely independent of access to care and MI severity. Individual factors related to better prognosis after MI were ideal nonsmoking, body mass index, blood pressure, and fasting glucose.

Conclusions—Optimal Life's Simple 7 at middle age was associated with better prognosis after MI in later life. Our findings suggest a secondary prevention benefit of having better cardiovascular health status in midlife. (*J Am Heart Assoc*. 2018;7: e007658. DOI: 10.1161/JAHA.117.007658.)

Key Words: cardiovascular disease risk factors • Life's Simple 7 • myocardial infarction • secondary prevention

In 2010, the American Heart Association (AHA) announced the following strategic goal: "By 2020, to improve the cardiovascular health of all Americans by 20% while reducing death from cardiovascular disease and stroke by 20%."[1] To achieve this goal, the AHA recommended focusing on 7 cardiovascular health factors (smoking, body mass index [BMI], physical activity, diet, total cholesterol, blood pressure, and fasting blood glucose) for primordial or primary prevention of cardiovascular disease and defined them as Life's Simple 7.[1,2] The selection of these 7 factors is based on their contributions to incident cardiovascular disease.[1]

However, it is unknown whether better achievement of Life's Simple 7 at middle age is associated with better prognosis after incident cardiovascular disease in later life. To complicate this question, a few studies have reported that a higher number of traditional risk factors at admission was counterintuitively associated with lower in-hospital mortality in patients with myocardial infarction (MI).[3–5] However, these studies retrospectively collected information on traditional risk factors at or before MI diagnosis, mainly relying on medication use for defining hypertension, diabetes mellitus, and dyslipidemia. Thus, as the authors of these studies

Clinical Perspective

What Is New?

- In addition to its association with incident myocardial infarction, higher score on 7 health factors (indicating better lifestyle and health status) at middle age was independently associated with better prognosis after incident myocardial infarction in later life.
- Among the individual 7 health factors, ideal status of smoking, body mass index, blood pressure, and fasting glucose in midlife were robust predictors of better prognosis after myocardial infarction in later life.

What Are the Clinical Implications?

- Our data provide new insights about the importance of maintaining or achieving optimal lifestyle and health status in midlife for cardiovascular health in later life.
- Our data also suggest the potential usefulness of individual historical information for predicting future prognosis after the development of cardiovascular disease, such as myocardial infarction.

acknowledged, these studies are subject to potential bias (ie, the presence of risk factors reflecting better detection and management of these risk factors and leading to a better prognosis compared with those without diagnosed or treated risk factors).

Therefore, to quantify the potential importance of optimal Life's Simple 7 in secondary prevention setting and overcome the methodological caveat in those previous studies with retrospective data collection at hospital admission, we explored data from a prospective community-based cohort, the ARIC (Atherosclerosis Risk in Communities) Study, with long-term follow-up for the assessment of outcomes. We primarily quantified the association of Life's Simple 7, incorporating measured blood pressure and levels of fasting glucose and total cholesterol in addition to medication use and health behaviors at middle age with the risk of adverse outcomes after incident MI in later life. To provide a complete picture, we secondarily assessed the contribution of Life's Simple 7 to incident MI as well, although ARIC Study data have previously reported the relationship with cardiovascular disease incidence.[6,7]

Methods

Study Population and Design

The ARIC Study is a community-based cohort of 15 792 middle-aged men and women (45–64 years old) at baseline (1987–1989).[8] Detailed policies for accessing ARIC Study data are available at the ARIC Study website.[9] It is also possible to obtain ARIC Study data from the National Heart, Lung, and Blood Institute BioLINCC repository.[10] Study participants were predominantly whites and blacks and were recruited from 4 US communities: Forsyth County, North Carolina; Jackson, Mississippi; suburbs of Minneapolis, Minnesota; and Washington County, Maryland. An institutional review board at each site approved the study, and study participants provided documentation of informed consent at each study visit.

This study has 2 sets of survival analysis: (1) the associations of Life's Simple 7 at middle age with incident MI in the entire study population (secondary analysis) and (2) the associations of Life's Simple 7 at middle age with adverse outcomes after incident MI among those who developed MI during follow-up (primary analysis) (Figure S1). For the former, of 15 792 ARIC Study participants, we excluded participants who had a history of coronary heart disease, stroke, or heart failure at baseline (n=1595) or who were neither whites nor blacks (n=33). We further excluded 632 participants who did not have complete information on Life's Simple 7 or 421 participants with nonfasting glucose or cholesterol levels, leaving a sample of 13 079 participants. Of these 13 079 participants, 1277 developed incident MI during a median follow-up of 24.2 years; they constituted the study sample for the latter main analysis in patients with MI (Figure S2).

Data Collection and Life's Simple 7 at ARIC Study Baseline Visit 1

At visit 1 (1987–1989), trained interviewers administered a questionnaire to collect information on demographic characteristics, medical history, medication use, and health behaviors (smoking status, physical activity, and diet). Use of antihypertensive, cholesterol-lowering, and glucose-lowering medications within the past 2 weeks of baseline interview were self-reported and confirmed by the inspection of medication containers. Physical activity was reported with the Baecke questionnaire,[11] and diet was assessed by modified 66-item Harvard food frequency questionnaire.[12] Information on education level, total household income for the past 12 months, and insurance status at baseline was based on questionnaire. BMI was calculated as weight (in kilograms) divided by the square of height (in meters). After 5 minutes of rest, 3 seated measurements of blood pressure were taken by a certified technician using a random-zero sphygmomanometer. The mean of the second and third measurements was used for analysis. Fasting glucose levels were measured by the modified hexokinase/glucose-6-phosphate dehydrogenase method. Fasting plasma total cholesterol concentration was assessed by enzymatic procedures.

Seven health factors were each categorized as ideal, intermediate, or poor, according to the AHA Life's Simple 7

criteria. Specifically, as previously done,[6] ideal levels of the Life's Simple 7 factors were defined as follows: nonsmoker or quit >1 year ago; BMI of <25 kg/m^2; ≥150 min/wk of moderate+vigorous physical activity; 4 to 5 components of a healthy diet pattern; untreated total cholesterol of <5.2 mmol/L; untreated blood pressure of <120/80 mm Hg; and untreated fasting glucose of <5.6 mmol/L (Table S1). Poor Life's Simple 7 factors included the following: Current smoker; BMI of ≥30 kg/m^2; no moderate or vigorous physical activity; 0 to 1 components of a healthy diet pattern; total cholesterol of ≥6.2 mmol/L; blood pressure of ≥140/90 mm Hg; and fasting glucose of ≥7.0 mmol/L regardless of medication use. Any conditions between ideal and poor were defined as intermediate. The score of Life's Simple 7 was calculated by providing 2 points for ideal, 1 point for intermediate, and 0 points for poor status of each of the 7 individual factors. Thus, the Life's Simple 7 summary score ranged from 0 to a maximum of 14 points, with a higher score indicating healthier status.

Ascertainment of Incident MI and Data Collection at Incident MI

Participants were followed up through December 31, 2013. Cardiovascular events in the ARIC Study were ascertained by contacting participants annually, identifying hospitalizations and deaths during the previous year, and surveying discharge lists from local hospitals and death certificates from state vital statistics offices for potential cardiovascular events. Incident MI was defined as definite or probable nonfatal MI cases adjudicated by the ARIC Study physician panel.[13]

We collected records for hospital discharges for MI, which were reviewed by trained abstractors for recording insurance status, medical history, and inpatient pharmacologic treatment. Because those with better Life's Simple 7 status may have less severe MIs compared with those with poorer Life's Simple 7 status, we determined MI severity, using a modified score of the Predicting Risk of Death in Cardiac Disease Tool that uses several clinical variables (cardiogenic shock; history of MI, stroke, or angina; age; severity of electrocardiographic changes; congestive heart failure; and Charlson Comorbidity Index) for a maximum score of 21 points, with a higher score indicating a more severe case.[14,15]

Adverse Outcomes After Incident MI

Adverse outcomes after incident MI of interest were all-cause mortality, cardiovascular mortality, recurrent MI, incident heart failure, and incident stroke. We also investigated the composite of those outcomes. Mortality was identified through active surveillance in the ARIC Study, and cardiovascular mortality was defined as death attributable to coronary heart disease, heart failure, or stroke. Recurrent MI was defined as adjudicated definite and probable MI cases after incident MI. Incident heart failure was defined as occurrence after MI of either a hospitalization or death having in any position an *International Classification of Diseases, Ninth Revision* (*ICD-9*) code 428 or an *ICD-10* code I50 for heart failure diagnosis. For stroke, using criteria adopted from the National Survey of Stroke,[16] incident definite or probable strokes were identified by computer algorithm and reviewed by a physician, with disagreements resolved by a second physician.

Statistical Analysis

Analyses were conducted using Stata statistical software version 14 (StataCorp LC, College Station, TX). Baseline characteristics are presented as means and SDs for continuous variables and proportions for categorical variables across categories of Life's Simple 7 summary score of 0 to 3, 4 to 6, 7 to 9, and ≥10.[17,18]

In terms of longitudinal analysis, we first examined the associations of Life's Simple 7 score and each individual health factor with incident MI in the entire study population. Survival free of incident MI was estimated across categories of Life's Simple 7 score using the Kaplan-Meier method. Hazard ratios were estimated using Cox proportional hazards models adjusting for demographic characteristics (age, sex, and race).

Then, as the main analysis, we quantified the associations of Life's Simple 7 score and each individual health factor at study baseline with adverse outcomes after incident MI among those who experienced incident MI during follow-up. Survival free of adverse outcomes was estimated across categories of Life's Simple 7 score using the Kaplan-Meier method. Subsequently, we quantified the associations of the Life's Simple 7 score and each health factor with those adverse outcomes using multivariable Cox proportional hazards models. *P* values for trend were based on Cox proportional hazards models with the Life's Simple 7 score using number 1 through 4 for the categories as discrete variables. We implemented 3 main models to evaluate the impact of potential confounders. Model 1 was adjusted for the following: age at MI, sex, race, calendar year of incident MI (<1995, 1995–2004, and ≥2005), clinical predictors at admission for poor prognosis in patients with MI[19] (a history of heart failure, stroke, coronary artery bypass graft, peripheral artery disease, and kidney dysfunction (estimated glomerular filtration rate of <60 mL/min per 1.73 m^2 within 1 year before MI or diagnosed chronic kidney disease), hypertension, diabetes mellitus, and current smoking at admission. We also further adjusted for health insurance at baseline (model 2a) and admission (model 2b).

We conducted several sensitivity analyses. We adjusted for year of school completed (≤12 and >12 years) and family income for the past 12 months (<$35 000 and ≥$35 000) at baseline as measures of socioeconomic status instead of health insurance (model 3). We also evaluated whether the adjustment for MI severity (represented by the Predicting Risk of Death in Cardiac Disease Tool score) (model 4) and aspirin use (model 5) altered results. We also evaluated whether the exclusion of MI cases who died within 14 days after incident MI changed results. In addition, we repeated the analysis after restricting the follow-up to 1, 3, and 5 years after incident MI because participants with poor Life's Simple 7 might have incident MI earlier than those with better Life's Simple 7 and, thus, would have higher chance of developing adverse outcomes with longer follow-up after incident MI. We also explored potential interaction by sex (female versus male), race (blacks versus whites), and center (Forsyth County versus Jackson versus suburbs of Minneapolis versus Washington County).

Results

Life's Simple 7 at Baseline and Incident MI in the Entire Study Population

In the entire study population, the mean age at baseline was 55 years old, 56% were women, and 24% were black. Those with a higher Life's Simple 7 score were more likely to be younger and white and have lower levels of BMI, blood pressure, fasting glucose, and total cholesterol compared with those with a lower Life's Simple 7 score (Table S2). Over a median follow-up of 24.2 years, there were 1277 incident MI cases. As anticipated, a higher Life's Simple 7 score was significantly associated with lower risk of incident MI in a graded manner (Table 1 and Figure S3). Compared with participants with Life's Simple 7 score of 0 to 3, those with a score of ≥10 and 7 to 9 had 84% and 67% lower risk of incident MI, respectively (hazard ratio, 0.16 [95% confidence interval, 0.12–0.22] and 0.33 [95% confidence interval, 0.26–0.43]) (Table 1). For individual Life's Simple 7 factors, the risk of

incident MI was lower, with ideal levels of health factors compared with poor levels with the exception of diet (Table S3).

Life's Simple 7 at Middle Age and Adverse Outcomes After Incident MI

Among participants with incident MI, the mean age at MI was 69 years old, 42% were women, and 24% were black. Of those participants, 59% had a Life's Simple 7 score of ≥7 at middle age (13% had a Life's Simple 7 score of ≥10) (Table 2 and Figure). Those with higher Life's Simple 7 scores tended to be older, female, and white, and have health insurance, higher family income, and higher education level, and lower levels of BMI, blood pressure, fasting glucose, and total cholesterol compared with those with lower Life's Simple 7 scores (Table 2).

Of 1277 participants with incident MI, 918 had adverse outcomes (661 all-cause deaths, including 258 cardiovascular deaths, 292 recurrent MI cases, 571 heart failure cases, and 129 stroke cases) during a median follow-up of 3.3 years (maximum follow-up, 26.2 years). For all outcomes tested, there was a sharp initial decrease for the composite outcome because ≈20% of patients with MI presented with heart failure within 1 month after incident MI (Figure S4). Overall, participants with higher Life's Simple 7 scores at middle age had a lower risk compared with those with lower scores. The pattern was generally consistent after adjusting for demographic variables and clinical comorbidities at MI admission, with significant associations for all outcomes except recurrent MI and stroke (model 1 in Table 3). The adjustment for health insurance (particularly at admission) to some extent attenuated the associations, although the associations for all-cause mortality, cardiovascular mortality, and the composite outcome remained consistently significant (models 2a and 2b in Table 3).

We observed similar results when we did the following: (1) adjusted for education level and family income over the past 12 months at baseline, instead of health insurance status; (2) accounted for MI severity; and (3) adjusted for aspirin use

Table 1. Crude Incidence Rate (per 1000 Person-Years) and Adjusted Hazard Ratio (95% CI) of Incident MI According to Life's Simple 7 Score at Baseline in the Entire Study Population (N=13 079), ARIC Study, 1987 to 2013

Variable	Score of Life's Simple 7				P Value for Trend
	0–3 (N=374)	4–6 (N=3137)	7–9 (N=6042)	≥10 (N=3526)	
MI cases	87	472	614	168	
Incidence rate	12.1	7.4	4.7	2.0	
Hazard ratio (95% CI)	1 (Reference)	0.53 (0.42–0.69)	0.33 (0.26–0.43)	0.16 (0.12–0.22)	<0.001

ARIC indicates the Atherosclerosis Risk in Communities Study; CI, confidence interval; and MI, myocardial infarction.
*The hazard ratio (95% CI) is adjusted for age at baseline, sex, and race.

Table 2. Basic Characteristics of the Participants With Incident MI (N=1277), According to Life's Simple 7 Score

Characteristics	Total (N=1277)	Score of Life's Simple 7			
		0–3 (n=77)	4–6 (n=445)	7–9 (n=593)	≥10 (n=162)
Demographic					
Age, y	55.9±5.6	54.7±5.4	55.7±5.5	56.3±5.7	55.6±5.4
Female sex	42.4	63.6	43.8	38.1	43.8
Black race	24.3	58.4	34.2	17.4	6.2
At study baseline					
Health insurance (yes)	89.7	76.6	84.3	93.4	97.5
Family income for the past 12 mo					
≥$25 000	57.0	20.8	49.2	60.2	74.7
Highest education					
≥12 y	70.5	42.9	62.9	74.9	88.3
Body mass index, kg/m^2	28.5±5.1	32.8±5.4	29.8±5.1	27.2±4.5	24.9±3.6
Systolic blood pressure, mm Hg	125.9±19.1	139.5±21.2	131.2±20.2	123.5±17.3	113.6±11.2
Diastolic blood pressure, mm Hg	75.3±12.2	82.0±13.3	78.6±13.3	73.7±10.8	69.0±8.9
Fasting glucose, mmol/L	6.4±2.5	8.4±3.3	7.0±3.1	6.0±2.0	5.4±1.1
Total cholesterol, mmol/L	5.8±1.1	6.6±1.1	6.2±1.2	5.6±1.0	5.3±1.0
HDL cholesterol, mmol/L	1.2±0.4	1.2±0.4	1.2±0.3	1.2±0.4	1.3±0.5
LDL cholesterol, mmol/L	3.9±1.1	4.4±1.0	4.2±1.1	3.7±1.0	3.4±1.0
Life's Simple 7 categories					
Smoking status					
Intermediate	32.6	20.8	32.1	34.6	32.1
Ideal	33.5	15.6	27.2	34.7	54.9
Body mass index					
Intermediate	43.2	15.6	43.6	48.4	35.8
Ideal	26.7	3.9	13.5	30.9	58.6
Physical activity					
Intermediate	4.2	3.9	4.0	4.6	3.1
Ideal	55.8	2.6	32.8	69.5	94.4
Healthy diet					
Intermediate	43.9	22.1	34.8	49.6	58.0
Ideal	5.3	0.0	1.8	6.1	14.8
Total cholesterol					
Intermediate	37.4	31.2	33.7	42.0	34.0
Ideal	29.0	6.5	18.2	33.4	53.1
Blood pressure					
Intermediate	47.6	40.3	49.4	51.3	32.7
Ideal	28.1	3.9	14.6	31.5	64.2
Glucose					
Intermediate	37.7	36.4	46.3	37.3	16.7
Ideal	46.1	7.8	29.2	53.8	82.1

Table 2. Continued

Characteristics	Total (N=1277)	Score of Life's Simple 7			
		0–3 (n=77)	4–6 (n=445)	7–9 (n=593)	≥10 (n=162)
At admission of MI					
Age at incident MI, y	68.7±8.8	65.1±8.5	68.0±8.5	69.3±9.0	70.4±8.6
Calendar year					
<1995	22.5	36.4	23.4	23.8	8.6
1996–2004	43.5	37.7	47.0	40.3	48.2
≥2005	34.1	26.0	29.7	35.9	43.2
MI severity score	7.4±3.4	7.8±3.2	7.5±3.6	7.3±3.3	7.0±3.6
Health insurance*	93.1	70.1	80.1	79.6	90.5
Medicare/Medicaid	61.3	52.0	52.6	51.6	59.3
Private	75.4	41.6	59.8	68.1	79.6

Data are given as mean±SD or percentage. HDL indicates high-density lipoprotein; LDL, low-density lipoprotein; and MI, myocardial infarction.
*Of 1277 patients with MI, 1102 have insurance data at admission.

(Table S4). Similarly, the exclusion of those who died within 14 days after MI did not alter the results (Table S5). When restricting the follow-up after MI to 1, 3, or 5 years, the associations were largely consistent across different durations of follow-up, although fewer outcomes reached statistical significance, given restricted number of MI cases and subsequent outcomes (Table S6). We did not observe any significant interactions by sex, race, and center in models 1 to 3 (data not shown).

We subsequently examined the associations of individual Life's Simple 7 factors with adverse outcomes after incident MI (Table S7). A better status of smoking, BMI, blood pressure, and fasting glucose at baseline was significantly associated with lower risk of adverse outcomes after incident MI, even in model 3, accounting for health insurance.
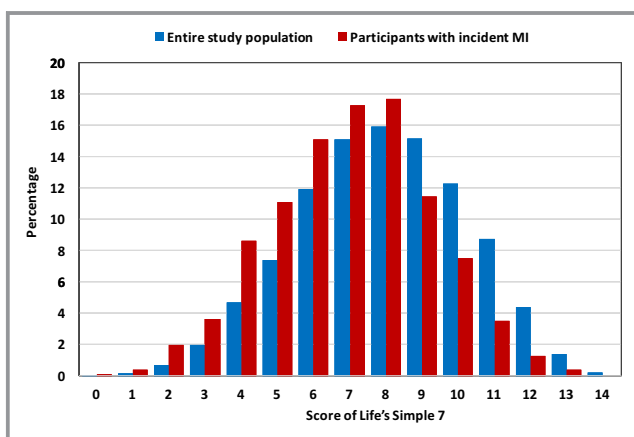

Figure. Distribution of Life's Simple 7 score in the entire study population (blue) and participants with incident myocardial infarction (MI) during follow-up (red).

Discussion

In this prospective community-based study, a higher Life's Simple 7 score in midlife was associated with lower risk of not only incident MI but also adverse outcomes after incident MI in later life. The association of Life's Simple 7 score with adverse outcomes after incident MI persisted even after accounting for clinical conditions at incident MI admission, health insurance status, and severity of MI. In terms of individual factors, ideal categories for nonsmoking, BMI, blood pressure, and fasting glucose in middle age were especially associated with better prognosis after incident MI at later life.

To our knowledge, our study is the first to report the association of Life's Simple 7 at middle age with adverse outcomes after MI in later life. More important, those with Life's Simple 7 score of ≥7 at the study baseline had ≈40% to 60% lower risk of total mortality after MI compared with those who had Life's Simple 7 score of ≤3. Our results indicate a secondary prevention benefit of ideal cardiovascular health status in midlife, which further supports the promotion of cardiovascular health on the basis of Life's Simple 7. Our results seem critically important because previous studies focusing on health factors at MI admission reported, counterintuitively, that "better" health status led to poorer MI prognosis.[3–5] Although our data do not have information on Life's Simple 7 factors at the time of MI admission, there may be a few explanations for this counterintuitive relationship. For example, some investigators suggested that patients with MI with better health status are older than patients with poor health status and, thus, have worse prognosis. This perspective is in line with our observation of participants with a higher score of Life's Simple 7 having incident MI at an older age than those with a lower score. Also, misclassification of health

Table 3. Adjusted Hazard Ratio (95% CI) of Adverse Outcomes After Incident MI According to Life's Simple 7 Score Among Patients With MI

Variable	Score of Life's Simple 7				P Value for Trend
	0–3 (N=77)	4–6 (N=445)	7–9 (N=593)	≥10 (N=162)	
Composite outcome					
Cases	71	345	421	81	
Model 1	1 (Reference)	0.80 (0.61–1.04)	0.73 (0.56–0.96)	0.52 (0.37–0.75)	<0.001
Model 2a	1 (Reference)	0.80 (0.61–1.04)	0.73 (0.56–0.96)	0.53 (0.37–0.75)	0.001
Model 2b (N=1102)	1 (Reference)	0.82 (0.60–1.11)	0.78 (0.57–1.07)	0.57 (0.39–0.84)	0.007
All-cause mortality					
Cases	57	273	287	44	
Model 1	1 (Reference)	0.78 (0.58–1.05)	0.51 (0.38–0.70)	0.32 (0.21–0.49)	<0.001
Model 2a	1 (Reference)	0.78 (0.58–1.05)	0.52 (0.38–0.70)	0.32 (0.21–0.49)	<0.001
Model 2b (N=1102)	1 (Reference)	0.84 (0.59–1.19)	0.60 (0.41–0.86)	0.34 (0.21–0.56)	<0.001
Cardiovascular mortality					
Cases	32	112	104	10	
Model 1	1 (Reference)	0.79 (0.52–1.20)	0.57 (0.36–0.88)	0.28 (0.13–0.61)	<0.001
Model 2a	1 (Reference)	0.79 (0.52–1.20)	0.57 (0.36–0.88)	0.28 (0.13–0.61)	<0.001
Model 2b (N=1102)	1 (Reference)	0.83 (0.50–1.39)	0.68 (0.40–1.18)	0.32 (0.14–0.74)	0.007
Recurrent MI					
Cases	24	113	131	24	
Model 1	1 (Reference)	0.92 (0.58–1.45)	0.79 (0.49–1.26)	0.59 (0.32–1.10)	0.048
Model 2a	1 (Reference)	0.93 (0.59–1.46)	0.81 (0.51–1.30)	0.62 (0.33–1.15)	0.075
Model 2b (N=1102)	1 (Reference)	1.04 (0.60–1.82)	0.91 (0.51–1.62)	0.74 (0.36–1.51)	0.213
Heart failure					
Cases	53	211	254	53	
Model 1	1 (Reference)	0.72 (0.52–0.98)	0.68 (0.49–0.95)	0.60 (0.39–0.92)	0.041
Model 2a	1 (Reference)	0.72 (0.52–0.98)	0.69 (0.50–0.95)	0.61 (0.40–0.93)	0.050
Model 2b (N=1102)	1 (Reference)	0.77 (0.54–1.10)	0.78 (0.54–1.13)	0.71 (0.45–1.12)	0.320
Stroke					
Cases	7	55	58	9	
Model 1	1 (Reference)	1.74 (0.78–3.89)	1.46 (0.64–3.31)	1.06 (0.37–3.05)	0.606
Model 2a	1 (Reference)	1.76 (0.79–3.93)	1.42 (0.62–3.22)	1.03 (0.36–2.95)	0.505
Model 2b (N=1102)	1 (Reference)	1.72 (0.67–4.40)	1.70 (0.65–4.44)	1.27 (0.40–4.07)	0.914

Model 1: adjusted for age at MI; sex; race; calendar year of incident MI (<1995, 1995–2004, and ≥2005); history of heart failure, stroke, coronary artery bypass graft, peripheral artery disease, kidney dysfunction, hypertension, and diabetes mellitus; and current smoking at admission. Model 2a: adjusted for model 1+health insurance at baseline. Model 2b: adjusted for model 1+health insurance at admission. CI indicates confidence interval; and MI, myocardial infarction.

factors at admission is possible, because the evaluation of health factors during MI hospitalization can be challenging. This may be particularly the case for blood pressure, because a decrease in blood pressure after MI is common and may reflect unstable hemodynamic state.[20] Potentially most importantly, apparently "better" health status at admission of MI may result from undiagnosed or untreated risk factors attributable to low awareness or worse healthcare access.[21]

For individual health and lifestyle factors, we found ideal levels of nonsmoking, BMI, blood pressure, and fasting glucose at middle age were associated with lower risk of adverse outcome after incident MI in later life. Those factors are well known to predict incident cardiovascular disease,[22–24] and our study uniquely demonstrated that the status of these factors at middle age would have prognostic value for prognosis after incident MI as well. In our study, healthy diet and physical

activity at baseline were not individually associated with adverse outcomes after incident MI. However, this may be attributable to quality of questionnaire data for these 2 factors. For dietary patterns in Life's Simple 7, some investigators raised a concern that adherence to the 5 AHA dietary recommendations is challenging.[25] In fact, in our study as well as previous ones, the prevalence of ideal diet patterns is low (<1%–6%).[17,18,26–28] This might partially explain no significant association, even with incident MI, an analysis with much higher statistical power than the analysis after incident MI.

Despite arguments for the so-called obesity paradox (ie, obesity increasing the risk of incident MI but decreasing the risk of adverse outcomes after MI),[29–31] ideal BMI at middle age was robustly associated with better prognosis after incident MI at later life in our study. Unfortunately, we did not have data on BMI at MI admission, precluding us from assessing obesity status at the time of MI. However, about the obesity paradox, a recent study demonstrated that obese individuals develop cardiovascular disease at a younger age than nonobese individuals and this age difference is a key driver behind the obesity paradox.[32] The same study reported that when periods both before and after the cardiovascular event were taken into account, obesity significantly shortened life expectancy. In this context, a lower risk of adverse outcomes after MI related to ideal BMI at baseline in our study may be explained by the fact that the key driver of the obesity paradox (ie, age difference at MI onset) was minimized in the ARIC Study by the narrow age range at baseline.

Contrasting the patterns of associations with incident MI versus adverse outcome after incident MI, smoking, BMI, blood pressure, and fasting glucose demonstrated consistently positive associations, whereas diet was consistently neutral. On the other hand, physical activity and total cholesterol were only significantly associated with incident MI. It is not surprising to see some factors only associated with incident MI, with higher statistical power than adverse outcomes after MI. In addition, physical activity is based on self-report and, thus, may have similar methodological caveats previously described for diet evaluation. For total cholesterol, the results might be influenced by lipid-lowering therapy. Specifically, it may be possible that individuals with poor cholesterol category might receive statins, which are shown to substantially reduce the risk of adverse outcomes among patients with MI.[33] Indeed, 79% of participants who were categorized in the poor cholesterol category at baseline were receiving lipid-lowering therapy at the time of MI admission (21% in the optimal category).

Our results have a few clinical and research implications. First, our study provides evidence for a secondary prevention benefit of maintaining better health status at middle age. Our finding demonstrates that adherence to Life's Simple 7, proposed by the AHA, could be effective in the public to prevent both primary and secondary cardiovascular risk. Second, our study suggests the potential usefulness of individual historical information for predicting future risk. Although it is probably not currently practical to obtain risk factor information from 10 to 20 years ago, with a broad implementation of electronical medical records, eventually, we will be able to refer to patients' historical data.

We also need to mention several limitations in our study. First, as previously noted, we relied on self-report for smoking, physical activity, and diet, and thus some misclassification is probably unavoidable for those behavioral variables. Second, use of a single measure of health factors might lead to underestimation of the true biological associations between Life's Simple 7 and adverse outcomes because of regression dilution bias.[34] Third, we could not include patients with MI who did not reach the hospital. Finally, we had no complete information on treatment of MI after discharge. Patients with better health factors or high socioeconomic status might get better treatment.

In conclusion, optimal (compared with poor) Life's Simple 7 at middle age was associated with not only lower incidence of hospitalized MI but also lower adverse outcomes after MI. Our findings suggest a secondary prevention benefit of ideal cardiovascular health status in midlife.

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Disclosures

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SUPPLEMENTAL MATERIAL

Table S1. Definition of Life's Simple 7 health factors at baseline (1987-1989).

	Ideal	**Intermediate**	**Poor**
Smoking	Never smoker	Former smoker	Current smoker
Body mass index	<25 kg/m^2	25-29.9 kg/m^2	≥30 kg/m^2
Physical activity	≥150 min/week moderate or ≥75 min/week vigorous or ≥150 min/week moderate + vigorous activity	1-149 min/week moderate or 1-74 min/week vigorous or 1-149 min/week moderate + vigorous activity	None
Diet score*	4-5 components	2-3 components	0-1 components
Total cholesterol	<5.2 mmol/L and not treated	5.2-6.1 or treated to <5.6 mmol/L	≥6.2 mmol/L
Blood pressure	SBP<120 and DBP<80 mmHg and not treated	SBP 120-139 or DBP 80-88 or treated to SBP <120 and DBP<80 mmHg	SBP ≥140 or DBP ≥90 mmHg
Fasting glucose	<5.6 mmol/L and not treated	5.6-6.9 or treated to <5.6 mmol/L	7.0 mmol/L

SBP indicates systolic blood pressure; DBP, diastolic blood pressure
* Meets criteria: Fruits and vegetables ≥4.5 servings/day, Fish ≥two 3-5 oz/week, Fiber-rich whole grains ≥3 servings/day, Sodium <1500mg/day, and sugar-sweetened beverages ≤4 glasses/week

Table S2. Baseline characteristics for study population according to score of Life's Simple 7, N=13,079.

	Score of Life's Simple 7				
	Total (N=13,079)	**0-3 (N=374)**	**4-6 (N=3,137)**	**7-9 (N=6,042)**	**≥10 (N=3,526)**
Age, years	54.5 (5.7)	55.1 (5.6)	55.1 (5.6)	54.6 (5.8)	53.5 (5.7)
Female	56.2%	62.8%	53.8%	52.4%	64.2%
Blacks	24.4%	59.4%	38.7%	22.4%	11.3%
Health insurance (yes)	91.1%	75.9%	86.4%	91.7%	95.8%
Family income for the past 12 months					
≥$25,000	62.5%	28.7%	49.4%	63.5%	76.0%
Highest education					
≥12 years	78.5%	54.3%	67.4%	70.4%	89.3%
Body mass index, kg/m^2	27.5 (5.2)	33.1 (5.1)	30.2 (5.5)	27.4 (4.8)	24.5 (3.4)
Systolic blood pressure, mmHg	120.6 (18.3)	139.1 (20.4)	129.7 (19.8)	120.5 (16.7)	110.8 (13.0)
Diastolic blood pressure, mmHg	73.5 (11.0)	82.0 (12.5)	78.1 (11.9)	73.4 (10.3)	68.8 (8.8)
Fasting glucose, mmol/L	5.9 (1.8)	7.9 (3.5)	6.6 (2.6)	5.7 (1.4)	5.3 (0.8)
Total cholesterol, mmol/L	5.5 (1.1)	6.5 (1.0)	6.0 (1.1)	5.5 (1.0)	5.1 (0.9)
HDL cholesterol, mmol/L	1.4 (0.4)	1.2 (0.4)	1.3 (0.4)	1.3 (0.4)	1.5 (0.5)
LDL cholesterol, mmol/L	3.5 (1.0)	4.5 (1.0)	3.9 (1.1)	3.6 (1.0)	3.1 (0.8)
Life's Simple 7					
Smoking status					
Intermediate	31.8%	29.7%	32.4%	34.0%	27.8%
Ideal	43.2%	15.0%	29.4%	40.7%	62.8%
Body mass index					
Intermediate	39.7%	17.4%	38.5%	46.4%	31.5%
Ideal	34.5%	2.7%	13.3%	30.5%	63.6%
Physical activity					
Intermediate	4.1%	2.1%	3.6%	4.7%	3.7%
Ideal	59.8%	2.9%	26.7%	62.8%	90.1%
Healthy diet					
Intermediate	44.0%	15.5%	32.5%	45.0%	55.6%
Ideal	6.3%	0.8%	2.0%	4.7%	13.4%
Total cholesterol					
Intermediate	36.1%	27.0%	35.6%	39.8%	31.1%
Ideal	39.4%	4.8%	23.1%	37.3%	61.0%
Blood pressure					
Intermediate	42.2%	38.8%	50.9%	47.6%	25.4%
Ideal	41.5%	3.5%	16.7%	39.0%	71.7%
Glucose					
Intermediate	35.6%	47.6%	50.7%	38.6%	15.9%
Ideal	56.8%	11.8%	31.7%	57.0%	83.5%

HDL indicates high-density lipoprotein; LDL, low-density lipoprotein

Table S3. Risk of incident myocardial infarction by Life's Simple 7 Health Factors, N=13,079.

Life's Simple 7 factors	Poor	Intermediate	Ideal
Smoking status			
N (%)	3,272 (25.0)	4,156 (31.8)	5,651 (43.2)
Cases	433	416	428
HR (95%CI)	1 (ref.)	0.50 (0.43-0.57)	0.44 (0.39-0.51)
Body mass index			456
N (%)	3,377 (25.8)	5,190 (40.0)	4,512 (34.5)
Cases	385	551	341
HR (95%CI)	1 (ref.)	0.91 (0.79-1.04)	0.78 (0.67-0.92)
Physical activity			
N (%)	4,726 (36.1)	533 (4.1)	7,820 (59.8)
Cases	511	53	713
HR (95%CI)	1 (ref.)	1.05 (0.79-1.39)	0.85 (0.75-0.96)
Healthy diet			
N (%)	6,498 (49.7)	5,759 (44.0)	822 (6.3)
Cases	649	560	68
HR (95%CI)	1 (ref.)	0.98 (0.87-1.09)	0.89 (0.69-1.14)
Total cholesterol			
N (%)	3,211 (24.6)	4,718 (36.1)	5,150 (39.4)
Cases	429	478	370
HR (95%CI)	1 (ref.)	0.78 (0.69-0.89)	0.56 (0.49-0.65)
Blood pressure			
N (%)	2,142 (16.4)	5,514 (42.2)	5,423 (41.5)
Cases	310	608	359
HR (95%CI)	1 (ref.)	0.73 (0.63-0.84)	0.48 (0.41-0.56)
Fasting glucose			
N (%)	993 (7.6)	4,662 (35.6)	7,424 (56.8)
Cases	207	482	588
HR (95%CI)	1 (ref.)	0.43 (0.36-0.50)	0.40 (0.34-0.47)

CI indicates confidence interval; HR, hazard ratio
*Adjusted for age, sex, race and each of Life's Simple 7 health factors

Table S4. Hazard ratio (95% CI) of adverse outcomes after incident myocardial infarction according to score of Life's Simple 7 among myocardial infarction patients after adjusting socioeconomic status and myocardial infarction severity.

	Score of Life's Simple 7				
	0-3 **(N=77)**	**4-6** **(N=445)**	**7-9** **(N=593)**	**≥10** **(N=162)**	**P for trend**
Composite outcome					
Cases	71	345	421	81	
Model 3 (N=1,250)	1 (ref.)	0.80 (0.61-1.05)	0.75 (0.56-0.99)	0.55 (0.38-0.79)	0.002
Model 4 (N=890)	1 (ref.)	0.95 (0.69-1.31)	0.84 (0.60-1.18)	0.54 (0.34-0.83)	0.002
Model 5	1 (ref.)	0.80 (0.62-1.05)	0.74 (0.56-0.97)	0.53 (0.37-0.76)	0.01
All-cause mortality					
Cases	57	273	287	44	
Model 3 (N=1,250)	1 (ref.)	0.81 (0.60-1.10)	0.54 (0.39-0.74)	0.33 (0.21-0.51)	<0.001
Model 4 (N=890)	1 (ref.)	0.93 (0.65-1.34)	0.53 (0.36-0.78)	0.29 (0.17-0.50)	<0.001
Model 5	1 (ref.)	0.79 (0.58-1.06)	0.52 (0.38-0.70)	0.32 (0.21-0.49)	<0.001
Cardiovascular mortality					
Cases	32	112	104	10	
Model 3 (N=1,250)	1 (ref.)	0.81 (0.53-1.24)	0.59 (0.38-0.93)	0.31 (0.14-0.67)	<0.001
Model 4 (N=890)	1 (ref.)	0.76 (0.47-1.23)	0.48 (0.29-0.82)	0.24 (0.09-0.63)	<0.001
Model 5	1 (ref.)	0.79 (0.52-1.19)	0.56 (0.36-0.88)	0.28 (0.13-0.60)	<0.001
Recurrent MI					
Cases	24	113	131	24	
Model 3 (N=1,250)	1 (ref.)	0.91 (0.57-1.44)	0.79 (0.49-1.27)	0.59 (0.31-1.11)	0.065
Model 4 (N=890)	1 (ref.)	1.00 (0.59-1.69)	0.76 (0.44-1.31)	0.66 (0.32-1.35)	0.058
Model 5	1 (ref.)	0.91 (0.57-1.43)	0.77 (0.48-1.23)	0.58 (0.31-1.07)	0.040
Heart failure					
Cases	53	211	254	53	
Model 3 (N=1,250)	1 (ref.)	0.73 (0.53-1.01)	0.71 (0.51-0.99)	0.66 (0.43-1.02)	0.122
Model 4 (N=890)	1 (ref.)	0.75 (0.51-1.09)	0.72 (0.49-1.07)	0.55 (0.32-0.94)	0.066
Model 5	1 (ref.)	0.73 (0.53-1.00)	0.69 (0.50-0.96)	0.61 (0.40-0.94)	0.049
Stroke					
Cases	7	55	58	9	
Model 3 (N=1,250)	1 (ref.)	1.74 (0.78-3.91)	1.52 (0.66-3.48)	1.17 (0.40-3.40)	0.821
Model 4 (N=890)	1 (ref.)	1.13 (0.49-2.60)	1.02 (0.43-2.41)	0.49 (0.13-1.81)	0.328
Model 5	1 (ref.)	1.77 (0.79-3.96)	1.49 (0.65-3.37)	1.19 (0.38-3.16)	0.644

CI indicates confidence interval; MI, myocardial infarction
Model 3: Adjusted for Model 1 + year of school completed (≤12 and >12 years) and family income for the past 12 months (<$35,000 and ≥$35,000) at baseline
Model 4: Adjusted for Model 1 + MI severity
Model 5: Adjusted for Model 1 + aspirin use

Table S5. Adjusted hazard ratio (95% CI) * of adverse outcomes after incident myocardial infarction according to score of Life's Simple 7 among myocardial infarction patients after excluding those who died within 14 days after myocardial infarction (N=1,245).

	Score of Life's Simple 7				
	0-3 (N=76)	4-6 (N=428)	7-9 (N=583)	≥10 (N=158)	P for trend
Composite outcome					
Cases	68	318	384	70	
Model1	1 (ref.)	0.75 (0.57-0.98)	0.61 (0.46-0.81)	0.43 (0.30-0.63)	<0.001
Model2a	1 (ref.)	0.75 (0.57-0.99)	0.62 (0.47-0.82)	0.44 (0.31-0.64)	<0.001
Model2b (N=1,159)	1 (ref.)	0.73 (0.54-1.00)	0.63 (0.46-0.87)	0.46 (0.31-0.69)	<0.001
All-cause mortality					
Cases	56	256	278	40	
Model1	1 (ref.)	0.75 (0.55-1.01)	0.51 (0.37-0.69)	0.29 (0.19-0.45)	<0.001
Model2a	1 (ref.)	0.75 (0.55-1.01)	0.51 (0.37-0.70)	0.29 (0.19-0.46)	<0.001
Model2b (N=1,159)	1 (ref.)	0.80 (0.56-1.14)	0.59 (0.41-0.86)	0.32 (0.19-0.52)	<0.001
Cardiovascular mortality					
Cases	32	109	100	10	
Model1	1 (ref.)	0.69 (0.45-1.05)	0.42 (0.27-0.66)	0.21 (0.10-0.44)	<0.001
Model2a	1 (ref.)	0.69 (0.46-1.06)	0.42 (0.27-0.66)	0.21 (0.10-0.45)	<0.001
Model2b (N=1,159)	1 (ref.)	0.69 (0.42-1.16)	0.50 (0.29-0.86)	0.23 (0.10-0.54)	<0.001
Recurrent MI					
Cases	24	112	131	24	
Model1	1 (ref.)	0.91 (0.58-1.44)	0.80 (0.50-1.27)	0.60 (0.32-1.11)	0.061
Model2a	1 (ref.)	0.92 (0.59-1.46)	0.82 (0.51-1.31)	0.62 (0.33-1.16)	0.093
Model2b (N=1,159)	1 (ref.)	1.04 (0.59-1.81)	0.92 (0.52-1.64)	0.75 (0.37-1.53)	0.255
Heart failure					
Cases	40	145	169	37	
Model1	1 (ref.)	0.57 (0.40-0.83)	0.46 (0.32-0.67)	0.43 (0.26-0.71)	0.001
Model2a	1 (ref.)	0.57 (0.40-0.83)	0.46 (0.32-0.67)	0.44 (0.26-0.72)	0.001
Model2b (N=1,159)	1 (ref.)	0.54 (0.35-0.82)	0.47 (0.31-0.73)	0.48 (0.28-0.83)	0.021
Stroke					
Cases	6	50	47	7	
Model1	1 (ref.)	1.88 (0.79-4.46)	1.39 (0.57-3.38)	0.94 (0.29-3.02)	0.326
Model2a	1 (ref.)	1.90 (0.80-4.54)	1.36 (0.56-3.32)	0.92 (0.29-2.96)	0.280
Model2b (N=1,159)	1 (ref.)	1.96 (0.69-5.60)	1.78 (0.61-5.18)	1.23 (0.33-4.53)	0.838

CI indicates confidence interval; MI, myocardial infarction

Model 1: Adjusted for age at MI, sex, race and calendar year of incident MI (<1995, 1995-2004, and ≥2005), history of heart failure, stroke, coronary artery bypass graft, peripheral artery disease, kidney dysfunction, hypertension, diabetes, and current smoking at admission

Model 2a: Adjusted for Model 1+ health insurance at baseline

Model 2b: Adjusted for Model 1 + health insurance at admission

Table S6. Adjusted hazard ratio (95% CI) * of adverse outcomes after restricting follow-up time after incident myocardial infarction according to score of Life's Simple 7 among myocardial infarction patients.

	Score of Life's Simple 7				
	0-3	**4-6**	**7-9**	**≥10**	**P for trend**
1 year	N=55	N=377	N=488	N=146	
Composite outcome					
Cases	31	143	179	41	
Model 2b	1 (ref.)	0.75 (0.50-1.13)	0.75 (0.50-1.14)	0.69 (0.41-1.16)	0.311
All-cause mortality					
Cases	12	59	53	11	
Model 2b	1 (ref.)	0.78 (0.40-1.50)	0.48 (0.24-0.96)	0.39 (0.16-0.96)	0.003
Cardiovascular mortality					
Cases	3	24	18	3	
Model 2b	1 (ref.)	1.62 (0.46-5.65)	0.99 (0.27-3.66)	0.79 (0.14-4.38)	0.259
Recurrent MI					
Cases	2	23	30	4	
Model 2b	1 (ref.)	1.99 (0.46-8.64)	2.06 (0.47-9.09)	0.93 (0.16-5.51)	0.707
Heart failure					
Cases	25	111	129	35	
Model 2b	1 (ref.)	0.80 (0.51-1.26)	0.78 (0.49-1.25)	0.92 (0.52-1.63)	0.867
Stroke					
Cases	3	13	15	3	
Model 2b	1 (ref.)	0.79 (0.21-2.93)	0.92 (0.24-3.60)	0.90 (0.15-5.31)	0.888
3 years	N=53	N=350	N=439	N=131	
Composite outcome					
Cases	30	163	201	38	
Model 2b	1 (ref.)	0.77 (0.51-1.16)	0.76 (0.50-1.14)	0.71 (0.42-1.20)	0.316
All-cause mortality					
Cases	15	85	77	15	
Model 2b	1 (ref.)	0.76 (0.42-1.39)	0.57 (0.31-1.06)	0.62 (0.27-1.40)	0.058
Cardiovascular mortality					
Cases	6	36	27	5	
Model 2b	1 (ref.)	1.20 (0.46-3.09)	0.66 (0.23-1.86)	1.06 (0.27-4.19)	0.253
Recurrent MI					
Cases	6	41	45	3	
Model 2b	1 (ref.)	0.83 (0.34-2.06)	0.76 (0.29-1.98)	0.31 (0.07-1.36)	0.175
Heart failure					
Cases	24	120	128	31	
Model 2b	1 (ref.)	0.79 (0.50-1.25)	0.80 (0.50-1.29)	0.93 (0.51-1.68)	0.999
Stroke					
Cases	3	18	26	5	
Model 2b	1.00	1.06 (0.30-3.79)	0.80 (0.20-3.16)	1.55 (0.30-7.91)	0.944
5 years	N=49	N=314	N=392	N=112	
Composite outcome					
Cases	32	155	198	39	
Model 2b	1 (ref.)	0.89 (0.60-1.34)	0.95 (0.63-1.43)	0.79 (0.47-1.33)	0.684
All-cause mortality					
Cases	16	86	87	16	
Model 2b	1 (ref.)	0.98 (0.55-1.74)	0.69 (0.38-1.24)	0.58 (0.26-1.28)	0.023
Cardiovascular mortality					
Cases	5	38	31	6	
Model 2b	1 (ref.)	0.78 (0.28-2.17)	0.49 (0.16-1.47)	0.80 (0.20-3.21)	0.251
Recurrent MI					
Cases	7	46	53	10	
Model 2b	1 (ref.)	0.66 (0.29-1.52)	0.62 (0.26-1.49)	0.29 (0.10-0.89)	0.047
Heart failure					
Cases	25	110	118	29	
Model 2b	1 (ref.)	0.95 (0.59-1.51)	1.01 (0.62-1.64)	1.11 (0.60-2.05)	0.580
Stroke					
Cases	4	21	33	4	
Model 2b	1 (ref.)	0.75 (0.24-2.36)	0.73 (0.22-2.38)	1.20 (0.25-5.68)	0.936

CI indicates confidence interval; MI, myocardial infarction

Model 2b: Adjusted for Model 1 + health insurance at admission

Table S7. Hazard ratios (95%CI)* for composite outcome according to the status of each individual Life's Simple 7 factor among those who had incident myocardial infarction during follow-up, N=1,277.

Life's Simple 7 factors	Poor	Intermediate	Ideal
Smoking status			
N (%)	433 (33.9)	416 (32.6)	428 (33.5)
Cases	326	299	293
Model 1	1 (ref.)	0.90 (0.74-1.10)	0.80 (0.65-0.97)
Model 2a	1 (ref.)	0.90 (0.74-1.10)	0.80 (0.65-0.98)
Model 2b (N=1,102)	1 (ref.)	0.96 (0.77-1.19)	0.85 (0.69-1.06)
Body mass index			
N (%)	385 (30.2)	551 (43.2)	341 (26.7)
Cases	309	386	223
Model 1	1 (ref.)	0.84 (0.72-0.99)	0.77 (0.63-0.93)
Model 2a	1 (ref.)	0.84 (0.72-0.99)	0.77 (0.63-0.93)
Model 2b (N=1,102)	1 (ref.)	0.87 (0.73-1.04)	0.77 (0.63-0.95)
Physical activity			
N (%)	511 (40.0)	53 (4.2)	713 (55.8)
Cases	389	40	489
Model 1	1 (ref.)	1.24 (0.89-1.73)	0.97 (0.84-1.11)
Model 2a	1 (ref.)	1.23 (0.89-1.72)	0.97 (0.84-1.12)
Model 2b (N=1,102)	1 (ref.)	1.18 (0.81-1.71)	0.97 (0.83-1.14)
Healthy diet			
N (%)	649 (50.8)	560 (43.9)	68 (5.3)
Cases	460	408	50
Model 1	1 (ref.)	1.05 (0.91-1.20)	1.23 (0.92-1.66)
Model 2a	1 (ref.)	1.05 (0.92-1.21)	1.24 (0.92-1.68)
Model 2b (N=1,102)	1 (ref.)	1.08 (0.93-1.26)	1.16 (0.84-1.62)
Total cholesterol			
N (%)	429 (33.6)	478 (37.4)	370 (29.0)
Cases	308	339	271
Model 1	1 (ref.)	1.06 (0.91-1.24)	1.18 (0.99-1.39)
Model 2a	1 (ref.)	1.07 (0.91-1.25)	1.18 (1.00-1.40)
Model 2b (N=1,102)	1 (ref.)	1.05 (0.88-1.25)	1.16 (0.97-1.40)
Blood pressure			
N (%)	310 (24.3)	608 (47.6)	359 (28.1)
Cases	262	429	227
Model 1	1 (ref.)	0.79 (0.68-0.94)	0.75 (0.61-0.92)
Model 2a	1 (ref.)	0.79 (0.68-0.93)	0.75 (0.61-0.92)
Model 2b (N=1,102)	1 (ref.)	0.80 (0.67-0.96)	0.71 (0.56-0.89)
Fasting glucose			
N (%)	207 (16.2)	482 (37.7)	588 (46.1)
Cases	190	341	387
Model 1	1 (ref.)	0.61 (0.50-0.74)	0.58 (0.47-0.73)
Model 2a	1 (ref.)	0.61 (0.50-0.74)	0.59 (0.47-0.73)
Model 2b (N=1,102)	1 (ref.)	0.66 (0.53-0.82)	0.68 (0.53-0.87)

CI indicates confidence interval; MI, myocardial infarction

Model 1: Adjusted for age at MI, sex, race and calendar year of incident MI (<1995, 1995-2004, and ≥2005), history of heart failure, stroke, coronary artery bypass graft, peripheral artery disease, kidney dysfunction, hypertension, diabetes, and current smoking at admission

Model 2a: Adjusted for Model 1 + health insurance at baseline

Model 2b: Adjusted for Model 1 + health insurance at admission

Figure S1. Study design.

Analysis 1: The association of Life's Simple 7 with incident MI in entire study population

Time 0   Follow-up

Life Simple 7 at
Visit 1   Incident MI

Analysis 2: The association of Life's Simple 7 with adverse outcomes after incident MI

Time 0   Follow-up

Life Simple 7 at
Visit 1   Incident MI   Adverse outcomes

MI indicates myocardial infarction.

Figure S2. Flow chart of study population.

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┌─────────────────────────────────┐
│  Enrolled in ARIC study          │
│  (1987-1989)                     │
│  N=15,792                        │
└─────────────────────────────────┘
              │
              │        ┌──────────────────────────────────────────────────┐
              │───────▶│ -  CHD, stroke, and heart failure at baseline     │
              │        │    (N=1,595)                                      │
              │        │ -  Non-white and non-black (N=33)                 │
              │        │ -  Missing information on Life's Simple 7 (N=632) │
              │        │ -  Non fasting glucose or cholesterol levels      │
              │        │    (N=421)                                        │
              │        └──────────────────────────────────────────────────┘
              ▼
┌─────────────────────────────────┐
│  Study population for Life's     │
│  Simple 7 and Incident MI        │
│  (Analysis 1)                    │
│  N=13,079                        │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Study population for Life's     │
│  Simple 7 and adverse outcomes   │
│  after incident MI               │
│  (Analysis 2 [main analysis])    │
│  N=1,277                         │
└─────────────────────────────────┘
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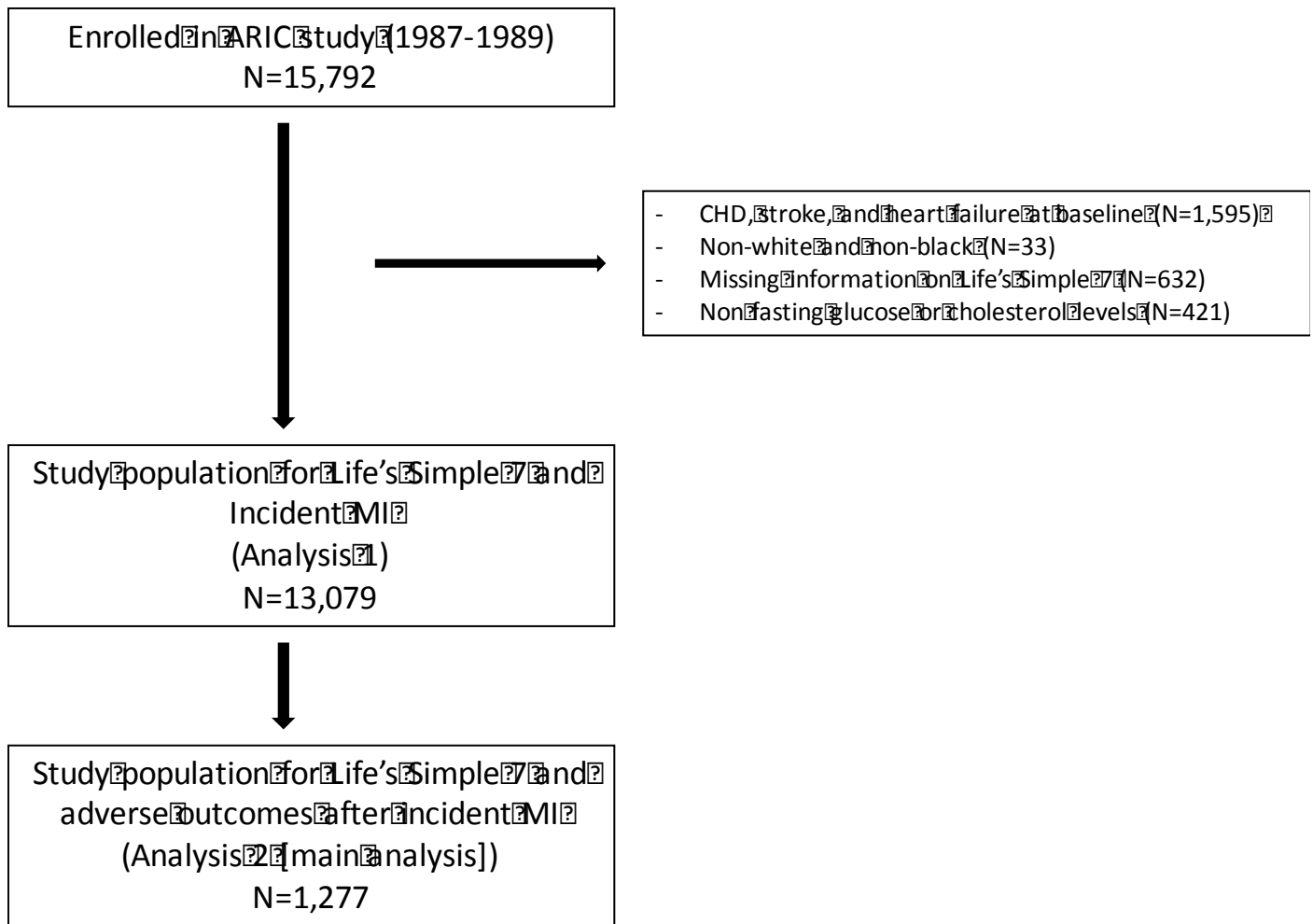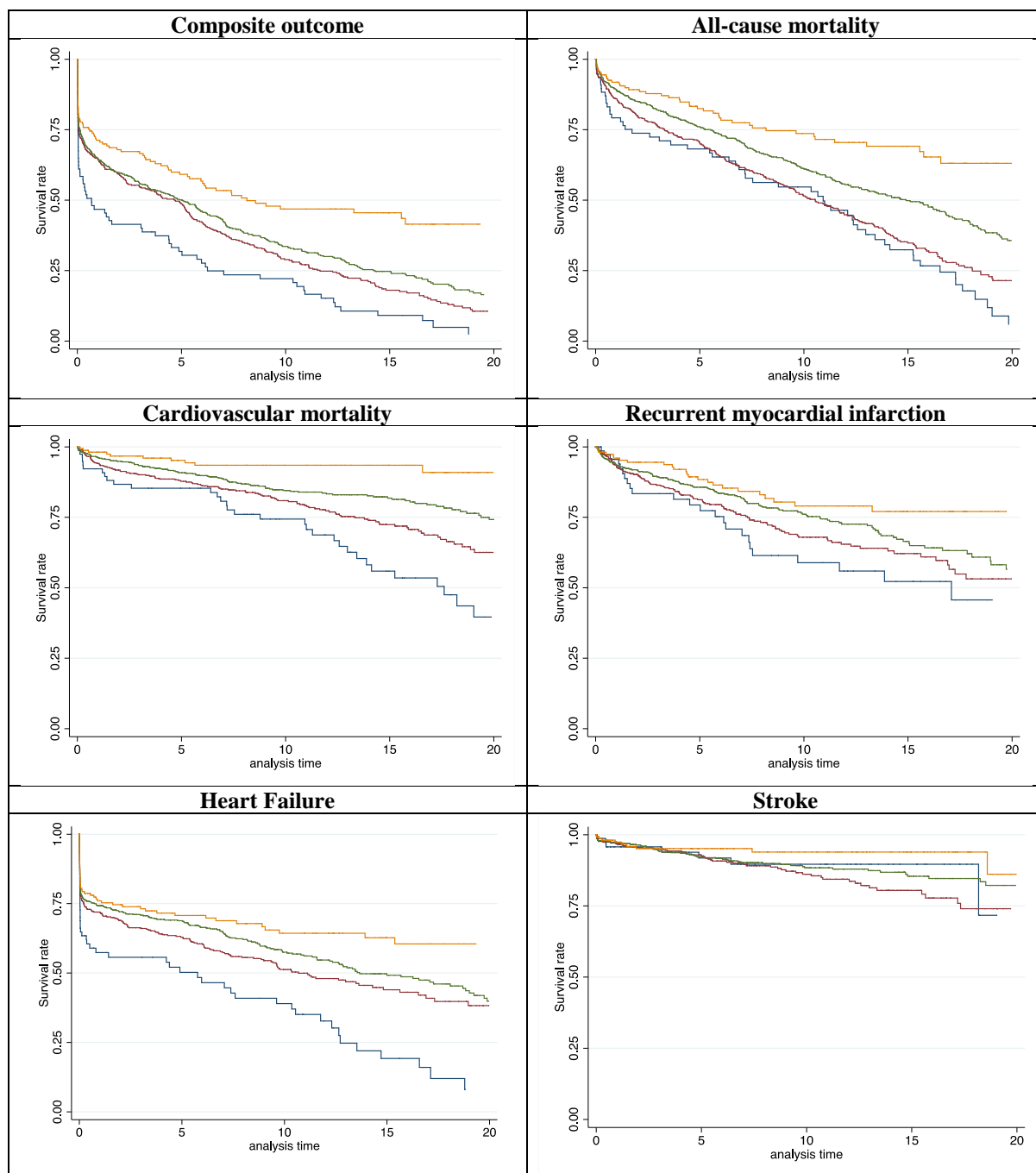
ARIC indicates the Atherosclerosis Risk in Communities Study; CHD, coronary heart disease; MI, myocardial infarction

Figure S3. Kaplan-Meier curves for incident myocardial infarction by the score of Life's Simple 7 in the entire study population.
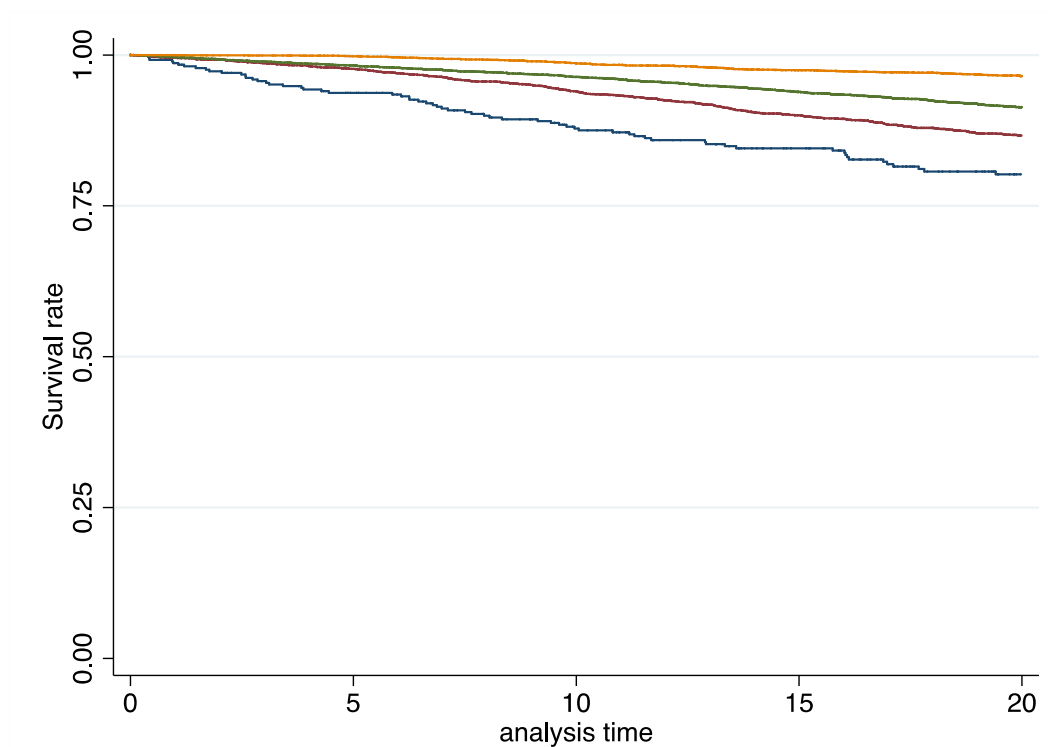
The legend indicates the score of ideal Simple 7 metrics (blue: 0-3, red: 4-6, green: 7-9, orange: ≥10)

Figure S4. Kaplan-Meier curves for cardiovascular mortality, recurrent myocardial infarction, heart failure, and stroke by Life's simple 7 score among myocardial infarction patients.

The legend indicates the score of ideal Simple 7 metrics (blue: 0-3, red: 4-6, green: 7-9, orange: ≥10)