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Life's Simple 7 Cardiovascular Health Score in Relation to Arrhythmias on Extended Ambulatory Electrocardiographic Monitoring (From the Multi-Ethnic Study of Atherosclerosis)

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Abstract

The Life's Simple 7 (LS7) metric consists of 7 modifiable health behaviors and measures that are known health factors for cardiovascular wellness. Relatively little is known about the association of LS7 score with cardiac arrhythmias. In the setting of the Multi-Ethnic Study of Atherosclerosis, we studied the LS7 score (range 0–14), assessed at the 2010–2102 study visit, in relation to cardiac arrhythmias assessed by Zio Patch ambulatory electrocardiographic monitoring in 2016–2018. In participants free of clinically recognized cardiovascular disease and atrial fibrillation (AF), we used logistic and linear regression to examine the association of total LS7 score with AF, supraventricular ectopy, and ventricular ectopy. Among 1329 participants in the analysis, the mean (standard deviation) age was 67 (8) years and 48% were men. More favorable total LS7 score was associated with fewer premature ventricular contractions (PVCs) per hour (ratio of geometric means for optimal (11–14) vs. inadequate (0–7) score 0.52 [95% confidence interval 0.34–0.81]). After adjustment for sociodemographic characteristics, the association was attenuated (0.66 [0.43, 1.01]). Among the LS7 components, more favorable body mass index (BMI) was associated with less ventricular ectopy. We did not detect associations of total LS7 score with atrial arrhythmias. In conclusion, in this longitudinal study of older individuals free of clinically recognized cardiovascular disease, there was little evidence of association of the LS7 cardiovascular health score with subclinical cardiac arrhythmias. However, there was a

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suggestion that more favorable LS7 score was associated with fewer PVCs and specifically, that more favorable BMI was associated with fewer PVCs.

Keywords

Life's Simple 7; atrial fibrillation; supraventricular ectopy; ventricular ectopy

Introduction

The Life's Simple 7 metric (LS7), introduced by the American Heart Association in 2010,[1] consists of 7 health behaviors and measures (smoking, body mass index (BMI), physical activity, diet, blood glucose, total cholesterol, and blood pressure), of which ideal levels are known health factors for cardiovascular wellness. Optimal LS7 status is associated with lower risk of clinically detected atrial fibrillation (AF)[2,3] and specifically, poor physical activity, elevated BMI, and elevated blood glucose are independently associated with greater AF burden.[4] A previous study reported an association of less favorable LS7 score with more frequent PACs,[5] but little is known about the association between the LS7 metrics and subclinical AF or other types of cardiac arrhythmia such as runs of supraventricular tachycardia (SVT), premature ventricular contractions (PVCs), and runs of non-sustained ventricular tachycardia (NSVT). Subclinical AF is known to be associated with increased risk of ischemic stroke,[6] supraventricular ectopy with future development of AF,[7] and ventricular ectopy with increased risks of heart failure and death.[8] If LS7 is shown to be associated with subclinical ectopy and arrhythmia, this information could provide additional support for achieving the American Heart Association 2020 strategic goals and improve estimates of the impact of achieving this goal.[9] In the Multi-Ethnic Study of Atherosclerosis (MESA), we conducted a large-scale analysis of LS7 score in relation to arrhythmia burden during ambulatory cardiac monitoring among participants without a prior diagnosis of AF, myocardial infarction (MI), heart failure, or stroke.

Methods

MESA is designed to study early cardiovascular disease and its progression. The study design has been described previously.[10] MESA includes 6814 men and women who self-identified as Black, Chinese-American, Hispanic, or White, recruited from 6 field centers (Baltimore, MD; Chicago, IL; Forsyth County, NC; Los Angeles, CA; New York City, NY; and St Paul, MN). All participants were 45–84 years of age and were free of clinically recognized cardiovascular disease at cohort entry. A baseline examination was conducted in 2000–2002 and 5 follow-up examinations have been conducted, including Exam 5 in 2010–2012 and Exam 6 in 2016–2018.

This analysis included all MESA participants with risk factor data available at Exam 5 who had ambulatory cardiac monitoring at Exam 6. We excluded participants who developed clinically recognized AF, MI, heart failure, or stroke before Exam 5 (Figure 1). Participants self-reported their age, sex, race/ethnicity, and years of education at the baseline exam. LS7 components measured at Exam 5 were used for this analysis. According to American Heart Association criteria,[1] smoking status was categorized as never, former or current.

Body mass index (BMI) was calculated as measured weight (kilograms) divided by squared height (meters). For physical activity, total minutes spent on intentional moderate and vigorous exercise were assessed by self-report using the MESA Typical Week Physical Activity Survey, adapted from the Cross-Cultural Activity Participation Study.[11] For diet, MESA participants filled out a modified-Block 120-item food frequency questionnaire that asked about average consumption of specific food items over the previous year.[12] Blood glucose and total cholesterol were measured from fasting blood samples. Blood pressure was measured from 3 readings taken after participants had rested for 5 minutes, and the average of the last 2 measurements was used for analysis. In addition, at Exam 5 participants reported their total family income, health insurance status, and use of hypertension, lipid-lowering, and diabetes medication.

Since baseline, participants have been contacted by telephone every 9 to 12 months to identify new hospitalizations and medical diagnoses during follow-up. Medical records were obtained; stroke, MI, and heart failure were adjudicated by the MESA Morbidity and Mortality Committee. Clinically recognized atrial fibrillation or atrial flutter (hereafter AF) were considered together and were identified by an International Classification of Diseases code (Ninth Revision: 427.31 or 427.32; Tenth Revision: I48) in any position assigned at hospital discharge; by 12-lead ECG at Exam 5; or, for those enrolled in fee-for-service Medicare, by an inpatient, outpatient, or physician claim with an AF diagnosis code in any position. Cardiovascular events were ascertained through the date of Exam 5.

At Exam 5, a subset of MESA participants (n=1557) enrolled in an ancillary study involving ambulatory ECG monitoring, as previously described.[13] The monitoring device used in this study was the Zio Patch XT (iRhythm Technologies, Inc, San Francisco, CA), a Food and Drug Administration–approved single-channel ECG patch monitor capable of recording up to 14 days of cardiac rhythm. Study staff applied the monitoring device and asked the participant to wear it for 14 days and to return it by mail to the manufacturer for interpretation. A subset of 577 participants had 2 monitoring periods of up to 14 days each, with a median interval of 23 days between monitoring periods. Certified technicians at iRhythm processed and analyzed the ECG data. Reported arrhythmias were verified by the Epidemiological Cardiology Reading Center at Wake Forest University School of Medicine, Winston-Salem, NC.

Atrial fibrillation was defined as an irregularly irregular rhythm with absent P waves lasting at least 30 seconds. Measures of supraventricular ectopy were the average count of PACs per hour and the average number of runs per day (24 hours) of SVT, with a run of SVT defined as ≥4 consecutive PACs. Average PACs per hour and average runs of SVT/day could not be calculated for participants in continuous AF throughout the monitoring period. Measures of ventricular ectopy were the average count of PVCs per hour and the average number of runs per day of NSVT, with a run defined as ≥4 consecutive PVCs. For participants who wore 2 monitoring devices, the monitored time from both devices was included in quantifying the arrhythmias.[14] Monitoring duration was defined as the total time during which the ECG tracing was adequate to determine rhythm.

Characteristics of participants at Exam 5 were reported stratified by race/ethnicity. Each of the LS7 components at Exam 5 was categorized as poor, intermediate, or ideal and scored (poor = 0 points, intermediate =1, and ideal = 2 points) as previously described (Table S1).[1] Total LS7 scores, also known as cardiovascular health scores[15], were calculated by summing the component scores and were categorized as inadequate (0–7 points), average (8–10 points), or optimal (11–14 points) cardiovascular health as previously defined.[16] In the present study sample, these 3 categories corresponded to approximately the lowest quartile, the middle 2 quartiles, and the upper quartile of the total LS7 score. Participants taking medications at Exam 5 to achieve ideal levels for cholesterol, blood pressure, or blood glucose were classified as intermediate for that health factor.[1]

Four of the outcome variables were highly right-skewed and were log-transformed for regression analysis (PACs per hour, PVCs per hour, runs of SVT per day, and runs of NSVT per day). About 18% of participants had no runs of SVT. To avoid losing the information from these participants when using the log transformation, we added the value of 1 to the number of runs of SVT for each participant, calculated the average number of runs of SVT per day, and then did the log transform. In a secondary analysis, to compare results with a previous study,[5] percent PACs (the percentage of all beats that were isolated supraventricular ectopic beats) was classified into 3 categories: minimal (<0.1%), occasional (≥0.1–5%) and frequent (>5%). We also examined results after adding back to the analysis the participants with a history of clinically recognized AF before Exam 5.

Logistic regression was used to estimate the odds ratios (OR) and 95% confidence intervals (CI) for the association of LS7 score with presence of any AF and with presence of any NSVT on the monitor. We used linear regression with robust standard errors to examine the association of LS7 score with average PACs per hour, average PVCs per hour, average runs of SVT/day, and among those with any NSVT, average runs of NSVT/day. We also examined the association of specific LS7 components with PVCs per hour. Associations from the linear regression analyses are expressed as the ratio of geometric means, which provides the average percentage difference in, for example, PVCs per hour, per increment of LS7 score. For the secondary analysis of categories of percent PACs, multinominal logistic regression was used to compare our result to a previous study.[5] Linear regression models were examined before and after adjustment for age, sex, race/ethnicity, education, family income, and health insurance. Logistic regression models were additionally adjusted for monitoring duration. All statistical analyses were conducted using Stata 15.1. A two-sided p-value < 0.05 indicated statistical significance.

Results

Among 4716 participants who attended Exam 5, 1458 completed ECG monitoring an average (standard deviation, SD) of 6.3 (0.5) years later and had data on all components of the LS7 score and other characteristics (Figure 1). We excluded 103 participants who developed clinically recognized cardiovascular disease before Exam 5, 6 who had no follow-up for AF before Exam 5, and 20 whose monitoring time was <24 hours, leaving 1329 participants in the analysis. The characteristics of participants included and not included in the analysis are described in Table S2.

Characteristics of participants included in the analysis are presented overall and by race/ethnicity in Table 1. The mean (SD) age at assessment of LS7 score was 67 (8) years, about half of participants were men, and participants were racially and ethnically diverse. The mean (SD) age at ambulatory ECG monitoring was 73 (8) years. Table 2 shows the number and proportion of participants in whom AF or NSVT were detected and the median (interquartile range, IQR) for the 4 measures of supraventricular and ventricular ectopy. The proportion of participants with minimal PACs was 40%, for occasional PACs, 57%, and for frequent PACs, 4%.

Total LS7, modeled as either a categorical variable or as a continuous variable, was not associated with the presence of AF or with the presence of NSVT detected by the monitor in multivariable logistic regression analyses (Table 3). In multivariable linear regression analyses with total LS7 modeled as a categorical variable, no associations were observed with PACs per hour, with runs of SVT per day, or with runs of NSVT per day, in either unadjusted models or in models adjusted for sociodemographic characteristics (Table 4, Figure 2).

Compared with those with inadequate LS7 scores, optimal total LS7 score was associated with fewer PVCs per hour in the unadjusted analysis (ratio of geometric means for optimal vs. inadequate 0.52; 95% confidence interval (CI) 0.34, 0.81, p-value=0.004; Table 4); this association was attenuated after adjustment for sociodemographic characteristics. Similarly, with LS7 score modeled as a continuous variable, each 1-point increase in score was associated with 9% fewer PVCs per hour in the unadjusted model (ratio of geometric means 0.91; 95% CI: 0.84, 0.97, p-value= 0.006; Table 4 and Figure 2), but the association was attenuated in the adjusted model (ratio of geometric means 0.94; 95%CI: 0.87, 1.01, p-value= 0.096). Further adjustment for PACs per hour did not change the associations. In the secondary analysis of total LS7 modeled as a continuous variable with percent PACs categorized as minimal, occasional, or frequent, we did not observe any significant associations (Table S3).

Because there was a suggestion of association of total LS7 score with PVCs per hour, additional analyses were conducted to assess the associations of individual LS7 components with PVCs per hour. After adjusting for potential confounders, compared with those with poor BMI, participants with intermediate BMI had a 30% fewer PVCs per hour (ratio of geometric means, 0.70, 95% CI 0.50, 0.96, p=0.03, Table 5). The point estimate was similar for those with ideal BMI compared with poor BMI (ratio of geometric means, 0.73, 95% CI 0.50, 1.08, p=0.11). No other individual LS7 components were associated with the frequency of PVCs. In secondary analyses where we added back participants with clinically recognized AF before Exam 5 (n=50), the results were similar (Table S4 and Table S5).

Discussion

In the MESA cohort of older individuals free of a history of clinically recognized AF, MI, heart failure, and stroke, there was little evidence of association of more favorable total LS7 cardiovascular health score with fewer arrhythmias as detected by ambulatory ECG monitoring an average of 6.3 years later. In unadjusted analyses, more favorable LS7 score was associated with fewer PVCs per hour, but these differences were no longer statistically significant after adjusting for sociodemographic characteristics. In analyses of individual LS7 components, more favorable BMI appeared to be associated with fewer PVCs per hour.

We are not aware of other studies that have examined LS7 score in relation to PVC frequency. Because we examined several arrhythmias, and for PVC frequency we examined all individual LS7 components, significant findings may have arisen by chance. Association of LS7 score with ventricular ectopy needs further study in other settings.

Past studies reporting an association of more favorable LS7 score with lower AF risk examined clinically detected AF as an outcome rather than monitor-detected AF,[2,3] or examined monitor-detected AF but included in the analysis individuals with a clinical history of AF.[4] The present analysis focused on participants with no history of clinically detected AF, MI, heart failure or stroke to examine whether more favorable LS7 was associated with subclinical arrhythmias. We found that associations with supraventricular ectopy were null. However, we were examining an older population that had already survived free of cardiovascular events and AF to Exam 5. It may be that favorable cardiovascular health has more impact earlier in life (i.e., primordial prevention). In an analysis of ambulatory ECG monitoring data from the Atherosclerosis Risk in Communities (ARIC) study that excluded participants with prior clinically recognized AF, total LS7 score from 21 years earlier was associated with lower odds of frequent PACs versus minimal PACs.[5] In our analysis in MESA, with a shorter interval of 6.3 years from LS7 score to ECG monitoring, point estimates were in the same direction as in ARIC but associations did not reach statistical significance. Participants in the ARIC analyses of LS7 in relation to arrhythmias were older at the time of monitoring (mean 79; SD 5 years) than MESA participants (mean 73, SD 8 years) and had more ectopy; these differences may have limited the ability to detect associations in MESA.

Several limitations of our study should be taken into consideration. First, intentional moderate and vigorous exercise were assessed by self-report rather than by objective measurement. The proportion of participants reporting physical activity in the ideal category was 67% and may have been overestimated. Second, health behaviors were collected a mean of 6.3 years before the ECG monitoring. Our analysis did not take into account that participants' health behaviors may have changed over time, which may have resulted in exposure measurement error. It is possible that health behaviors in early and mid-life are more relevant than health behaviors at older ages. Finally, we used uniform BMI categories across race and ethnic groups, but conventional BMI categories may not be appropriate for people with Asian ancestry.[17] Strengths of our analysis include the race and ethnic diversity of the cohort, the extended electrocardiographic monitoring, and the careful measurement of the LS7 components.

In summary, in this longitudinal study of individuals free of clinically recognized cardiovascular disease and AF, there was little evidence that total LS7 cardiovascular health score was associated with subclinical atrial and ventricular arrhythmias on extended ambulatory electrocardiographic monitoring. Nonetheless, the LS7 components are established health factors for cardiovascular wellness. Improving cardiovascular health remains an important public health goal.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Highlights

- Life's Simple 7 (LS7) is a score that reflects cardiovascular wellness
- We found little evidence that LS7 was associated with arrhythmias on Zio Patch
- However, there was a suggestion that better LS7 was associated with fewer PVCs

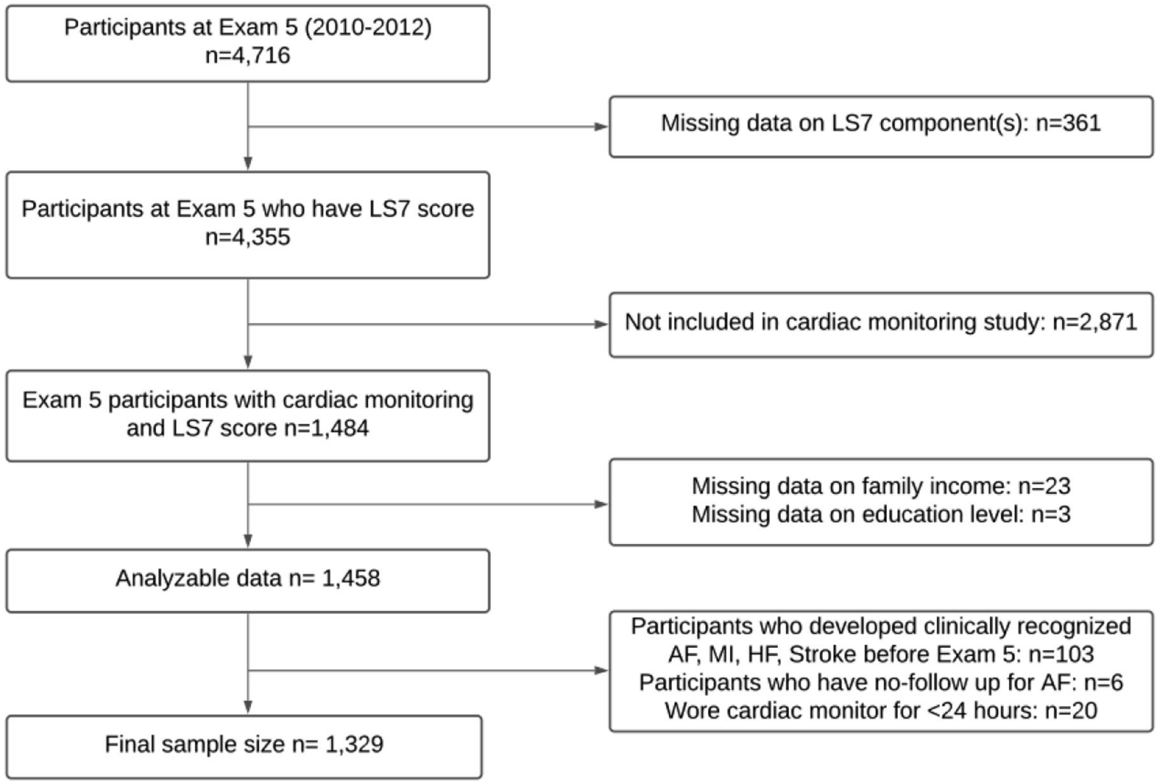

Figure 1.

Study participation and inclusion in analysis

AF=atrial fibrillation; HF=heart failure; LS7=Life's Simple 7; MI=myocardial infarction

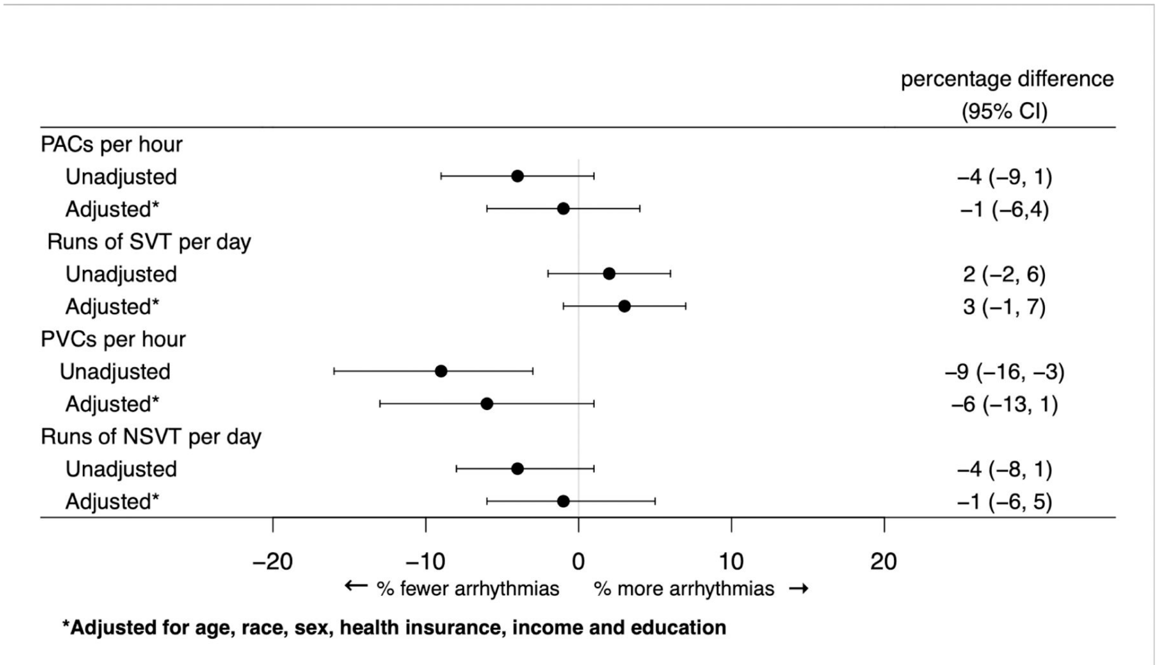

Figure 2.

Percentage difference in PACs per hour, runs of SVT per day, PVCs per hour, and runs of NSVT per day associated with 1-point increment in Life's Simple 7 score from linear regression

NSVT=non-sustained ventricular tachycardia; PAC=premature atrial contraction; PVC=premature ventricular contraction; SVT=supraventricular tachycardia

Table 1

Characteristics at Exam 5 (2010–2012) of MESA participants with Life's Simple 7 score and ambulatory electrocardiographic monitoring

Variable	Overall (N=1,329)	White (N=536)	Black (N=327)	Hispanic (N=276)	Chinese-American (N=190)
Age (years)					
53–64	617 (46%)	257 (48%)	139 (42%)	125 (46%)	96 (50%)
65–74	422 (32%)	166 (31%)	108 (33%)	90 (33%)	58 (31%)
>=75	290 (22%)	113 (21%)	80 (24%)	61 (22%)	36 (19%)
Men	638 (48%)	262 (49%)	132 (40%)	146 (53%)	98 (52%)
Total Family Income per year					
<$11,999	81 (6%)	9 (2%)	17 (5%)	34 (12%)	21 (11%)
$12,000-$24,999	205 (15%)	44 (8%)	46 (14%)	74 (27%)	41 (22%)
$25,000-$39,999	231 (17%)	63 (12%)	79 (24%)	62 (22%)	27 (14%)
$40,000-$99,999	517 (39%)	238 (44%)	134 (41%)	81 (29%)	64 (34%)
$100,000 or more	295 (22%)	182 (34%)	51 (16%)	25 (9%)	37 (19%)
Educational attainment					
High school graduate or less	368 (28%)	67 (12%)	84 (26%)	159 (58%)	58 (31%)
Attended college /technical school	329 (25%)	119 (22%)	113 (35%)	73 (26%)	24 (13%)
College graduate or higher	632 (48%)	350 (65%)	130 (40%)	44 (16%)	108 (57%)
No health insurance	113 (9%)	11 (2%)	21 (6%)	49 (18%)	32 (17%)
Hypertension medication	620 (47%)	215 (40%)	190 (58%)	129 (47%)	86 (45%)
Lipid-lowering medication	451 (34%)	195 (36%)	102 (31%)	96 (35%)	58 (31%)
Diabetes mellitus	180 (14%)	43 (8%)	63 (19%)	52 (19%)	22 (12%)
Cholesterol treated to <200 mg/dL	384 (29%)	169 (32%)	82 (25%)	84 (30%)	49 (26%)
Blood Pressure treated to <120/<80 mmHg	279 (21%)	279 (21%)	73 (22%)	56 (20%)	35 (18%)
Fasting Glucose treated to <100 mg/dL	36 (3%)	8 (1%)	19 (6%)	7 (3%)	2 (1%)
Smoking status					
Never	719 (54%)	258 (48%)	150 (46%)	158 (57%)	153 (81%)
Former	526 (40%)	246 (46%)	145 (44%)	104 (38%)	31 (16%)
Current	84 (6%)	32 (6%)	32 (10%)	14 (5%)	6 (3%)
BMI (kg/m2), mean (SD)	28.3 (5.4)	27.7 (5.0)	30.2 (5.3)	30.1 (5.5)	24.2 (3.1)
LDL cholesterol level (mg/dl), mean (SD)	109 (31)	109 (31)	111 (32)	106 (30)	111 (33)
Moderate and vigorous physical activity (min/week), median (IQR)	270 (75–600)	300 (105–600)	270 (60–630)	218 (0–578)	300 (105–660)
Life's Simple 7 Score					
Inadequate	336 (25%)	104 (19%)	115 (35%)	98 (36%)	19 (10%)
Average	734 (55%)	304 (57%)	178 (54%)	142 (51%)	110 (58%)
Optimal	259 (19%)	128 (24%)	34 (10%)	36 (13%)	61 (32%)
Smoking					
Poor	84 (6%)	32 (6%)	32 (10%)	14 (5%)	6 (3%)

Variable	Overall (N=1,329)	White (N=536)	Black (N=327)	Hispanic (N=276)	Chinese-American (N=190)
Intermediate	12 (1%)	5 (1%)	3 (1%)	3 (1%)	1 (1%)
Ideal	1233 (93%)	499 (93%)	292 (89%)	259 (94%)	183 (96%)
BMI					
Poor	437 (33%)	154 (29%)	156 (48%)	119 (43%)	8 (4%)
Intermediate	512 (39%)	206 (38%)	124 (38%)	118 (43%)	64 (34%)
Ideal	380 (29%)	176 (33%)	47 (14%)	39 (14%)	118 (62%)
Physical Activity					
Poor	252 (19%)	78 (15%)	67 (20%)	77 (28%)	30 (16%)
Intermediate	186 (14%)	78 (15%)	48 (15%)	36 (13%)	24 (13%)
Ideal	891 (67%)	380 (71%)	212 (65%)	163 (59%)	136 (72%)
Diet					
Poor	734 (55%)	314 (59%)	190 (58%)	178 (64%)	52 (27%)
Intermediate	591 (44%)	221 (41%)	137 (42%)	98 (36%)	135 (71%)
Ideal	4 (0%)	1 (0%)	0 (0%)	0 (0%)	3 (2%)
Total cholesterol					
Poor	98 (7%)	36 (7%)	28 (9%)	16 (6%)	18 (9%)
Intermediate	755 (57%)	326 (61%)	171 (52%)	151 (55%)	107 (56%)
Ideal	476 (36%)	174 (32%)	128 (39%)	109 (39%)	65 (34%)
Blood Pressure					
Poor	223 (17%)	66 (12%)	78 (24%)	45 (16%)	34 (18%)
Intermediate	680 (51%)	260 (49%)	193 (59%)	135 (49%)	92 (48%)
Ideal	426 (32%)	210 (39%)	56 (17%)	96 (35%)	64 (34%)
Fasting glucose					
Poor	102 (8%)	25 (5%)	32 (10%)	30 (11%)	15 (8%)
Intermediate	392 (29%)	127 (24%)	90 (28%)	102 (37%)	73 (38%)
Ideal	835 (63%)	384 (72%)	205 (63%)	144 (52%)	102 (54%)

Table 2.

Prevalence and frequency of arrhythmias in MESA participants overall and by categories of total Life's Simple 7 score

		Total Life's Simple 7 score		
Variable	**Overall**	**Inadequate (0–7)**	**Average (8–10)**	**Optimal (11–14)**
	(N=1,329)	(N=336)	(N=734)	(N=259)
AF present	70 (5%)	14 (4%)	43 (6%)	13 (5%)
NSVT present	351 (26%)	95 (28%)	191 (26%)	65 (25%)
PVCs per hour, median (IQR)	1.3 (0.2–9)	1.8 (0.2–8.9)	1.2 (0.2–10.0)	0.7 (0.1–6.7)
	(N=1,305) *	(N=161)	(N=889)	(N=255)
PACs per hour, median (IQR)	4.0 (1.4–18.9)	4.3 (1.5–19.3)	4.0 (1.3–18.3)	3.8 (1.4–18.9)
Runs of SVT per day, median (IQR)	0.5 (0.2–1.3)	0.4(0.2–1.1)	0.4 (0.2–1.3)	0.5 (0.2–1.4)
	(N=351) **	(N=95)	(N=191)	(N=65)
Runs of NSVT per day, median (IQR)	0.08 (0.07–0.15)	0.09 (0.07–0.21)	0.07 (0.07–0.14)	0.07(0.07–0.15)

* Sample size of 1305 excludes 24 participants in continuous atrial fibrillation

** Sample size of 351 is limited to participants who had any runs of NSVT during the monitoring period

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Table 3

Association of total Life's Simple 7 (LS7) score with the presence of arrhythmias from logistic regression (Odds Ratio (95% Confidence interval))

	Total LS7 score in 3 categories			Total LS7 score as a continuous variable Per 1-point increment in LS7
	Poor (0–7) (N=336)	**Intermediate (8–10) (N=734)**	**Ideal (11–14) (N=259)**	
Presence of AF				
Unadjusted	Reference	1.43 (0.77, 2.65)	1.21 (0.56, 2.63)	1.07 (0.94, 1.21)
Adjusted *	Reference	1.32 (0.70, 2.50)	1.16 (0.51, 2.62)	1.06 (0.92, 1.21)
Presence of NSVT				
Unadjusted	Reference	0.89 (0.69, 1.19)	0.85 (0.59, 1.23)	0.97 (0.91, 1.03)
Adjusted *	Reference	0.94 (0.69, 1.27)	0.96 (0.64, 1.43)	0.98 (0.92, 1.05)

* Results are adjusted for age, sex, race/ethnicity, education, income, health insurance, and monitoring duration

Table 4

Association of total Life's Simple 7 score with ectopy frequency from linear regression (Ratio of geometric means (95% Confidence interval))

	Total LS7 score in 3 categories			Total LS7 score as continuous variable Per 1-point increment in LS7
	Inadequate (0–7)	**Average (8–10)**	**Optimal (11–14)**	
PACs per hour				
Unadjusted	Reference	0.87 (0.69,1.11)	0.87 (0.65, 1.18)	0.96 (0.91, 1.01)
Adjusted *	Reference	0.89 (0.71, 1.11)	1.02 (0.77, 1.36)	0.99 (0.94, 1.04)
Runs of SVT per day				
Unadjusted	Reference	1.03 (0.85, 1.24)	1.21 (0.96, 1.52)	1.02 (0.98,1.06)
Adjusted *	Reference	1.03 (0.86, 1.24)	1.26 (1.00, 1.60)	1.03 (0.99,1.07)
PVCs per hour				
Unadjusted	Reference	0.78 (0.56, 1.10)	0.52 (0.34, 0.81)	0.91 (0.84, 0.97)
Adjusted *	Reference	0.81 (0.58, 1.12)	0.66 (0.43, 1.01)	0.94 (0.87, 1.01)
Runs of NSVT per day				
Unadjusted	Reference	0.82 (0.65,1.03)	0.90 (0.65, 1.22)	0.96 (0.92, 1.01)
Adjusted *	Reference	0.92 (0.73, 1.15)	1.06 (0.76, 1.50)	0.99 (0.94, 1.05)

* Results are adjusted for age, sex, race/ethnicity, education, income, and health insurance

Table 5.

Association* between LS7 individual components and PVCs per hour from multivariable linear regression

	Ratio of Geometric Means	95% Confidence interval	P value
Smoking			
Poor (N=85)	Reference		
Intermediate (N=12)	1.45	(0.29, 7.29)	0.65
Ideal (N=1237)	0.66	(0.38, 1.14)	0.14
BMI			
Poor (N=440)	Reference		
Intermediate (N=514)	0.70	(0.50, 0.96)	0.03
Ideal (N=380)	0.73	(0.50, 1.08)	0.11
Physical activity			
Poor (N=253)	Reference		
Intermediate (N=188)	1.14	(0.71, 1.85)	0.59
Ideal (N=893)	1.00	(0.70, 1.43)	0.99
Diet			
Poor (N=738)	Reference		
Intermediate (N=592)	0.97	(0.73, 1.29)	0.85
Ideal (N=4)	0.33	(0.03, 3.83)	0.37
Blood glucose			
Poor (N=103)	Reference		
Intermediate (N=396)	1.45	(0.85, 2.47)	0.17
Ideal (N=835)	0.95	(0.57, 1.58)	0.83
Total cholesterol			
Poor (N=98)	Reference		
Intermediate (N=759)	0.67	(0.37, 1.19)	0.17
Ideal (N=477)	0.95	(0.53, 1.73)	0.88
Blood pressure			
Poor (N=225)	Reference		
Intermediate (N=682)	1.11	(0.76, 1.65)	0.58
Ideal (N=427)	0.88	(0.57, 1.37)	0.57

*Adjusted for age, sex, race/ethnicity, education, income, and health insurance