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A Simple Community-Based Risk Prediction Score for Sudden Cardiac Death

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Abstract

Background—Although sudden cardiac death is a leading cause of death in the United States, most victims of sudden cardiac death are not identified as at-risk prior to death. We sought to derive and validate a population-based risk score that predicts sudden cardiac death.

Methods—The Atherosclerosis Risk in Communities (ARIC) Study recorded clinical measures from men and women aged 45–64 at baseline; 11,335 white and 3,780 black participants were included in this analysis. Participants were followed over 10 years and sudden cardiac death was physician-adjudicated. Cox proportional hazards models were used to derive race-specific equations to estimate the 10-year sudden cardiac death risk. Covariates for the risk score were selected from available demographic and clinical variables. Utility was assessed by calculating discrimination (Harrell's c-index) and calibration (Hosmer-Lemeshow chi-square test). The white-specific equation was validated among 5,626 Framingham Heart Study participants.

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Results—During 10 years' follow-up among ARIC participants (mean age 54.4 years, 52.4% women), 145 participants experienced sudden cardiac death; the majority occurred in the highest quintile of predicted risk. Model covariates included age, sex, total cholesterol, lipid-lowering and hypertension medication use, blood pressure, smoking status, diabetes, and body mass index. The score yielded very good internal discrimination (white-specific c-index: 0.82, 95% CI: 0.78–0.85; black-specific c-index: 0.75 (0.68–0.82)) and very good external discrimination among Framingham participants (c-index: 0.82 95% CI: 0.79–0.86). Calibration plots indicated excellent calibration in ARIC (white-specific χ^2 : 5.3, p=0.82, black-specific χ^2 : 4.1, p=0.77) and a simple recalibration led to excellent fit within Framingham (χ^2 : 2.1, p-value: 0.99).

Conclusions—The proposed risk scores may be used to identify those at risk for sudden cardiac death within 10 years, and particularly classify those at highest risk who may merit further screening.

Keywords

sudden cardiac death; risk factors; coronary heart disease

INTRODUCTION

Sudden cardiac death is the cause of an estimated 180,000 to 450,000 deaths annually in the United States.¹ Although most sudden cardiac death victims have coronary heart disease, the majority go undiagnosed prior to death.^{2,3} Despite public health efforts directed at treating victims of sudden cardiac arrest (i.e. cardiopulmonary resuscitation training, placement of automated external defibrillators), the survival rate remains very low.^{3,4} Experts have therefore sought improved methods to identify patients at substantial risk for sudden cardiac arrest who could be targeted for enhanced prevention efforts, such as enhanced screening for detection of arrhythmogenic substrate with the potential to use implantable cardioverter defibrillators.

Currently, the primary diagnostic tool used to estimate the risk of sudden cardiac death is left ventricular ejection fraction among individuals with known heart disease, but since the majority of sudden cardiac deaths occur among individuals without known pre-existing heart disease, a tool with better discrimination is needed to have meaningful impact on the population burden of sudden cardiac death.⁵ A variety of tests and clinical parameters have been proposed for risk stratification,^{6,7} yet there is no population-based approach to easily identify individuals at risk. As most sudden cardiac deaths do not occur in the high risk, low ejection fraction population,⁸ a novel tool is needed to screen at-risk patients in the general population based on easily identified characteristics.

Deo et al. recently proposed a risk score for sudden cardiac death which was validated in the Cardiovascular Health Study of older Americans (>65 years old),⁹ for whom the impact on life-years saved by prevention would be smaller than for younger ages. Some components of the risk score, including serum albumin, potassium, estimated glomerular filtration rate, and QT_c interval, are not routinely measured clinically. We sought to derive a simple risk prediction score to classify the 10-year risk of sudden cardiac death using commonly

measured clinical factors. We developed the model in a community-based cohort study and validated it in a separate cohort.

METHODS

The Atherosclerosis Risk in Communities Study (ARIC) is a longitudinal cohort study of Caucasian and African-American adults designed to understand risk factors associated with atherosclerosis; the study design has been described previously.¹⁰ Approximately 4,000 individuals were recruited from each of Washington County, MD; Forsyth County, NC; Jackson, MS; and Minneapolis, MN. At baseline (1987–1989), 15,792 participants aged 45 to 64 were examined.¹⁰

The Framingham Heart Study (FHS) is a community-based longitudinal cohort study with 5,209 participants at the baseline exam in 1948 including both men and women between 28 and 62 years of age. Physical examinations have been conducted biennially and cardiovascular events and causes of death are recorded as they occur; the study design has been described elsewhere.¹¹ The Framingham Offspring Study (FOF) similarly examines the offspring and spouses of the original FHS study and enrolled 5,124 participants in 1971.¹² All protocols were approved by the Institutional Review Board of Boston Medical Center.

The selection of the risk score covariates was derived using white participants from ARIC that attended the baseline examination. Coefficients for the same covariates were derived for black ARIC participants for a separate risk score. We validated the risk score within Framingham original cohort participants that attended the 11th examination (1967–1971) and Offspring participants that attended the first examination (1971–1975). Framingham participants were excluded if their baseline age was <30 or >70 years or if any risk score covariates were missing at baseline. For Framingham participants, we used a carry-forward approach for missing covariates: if a value was missing at exam 11 but recorded at exam 10, the value from exam 10 was used. We used a limited access dataset from Biologic Specimen and Data Repository Information Coordinating Center; the study was approved by the Northwestern University Institutional Review Board.

Candidate variables in our analysis included age, sex, total cholesterol, high-density lipoprotein cholesterol, systolic and diastolic blood pressure, use of lipid-lowering medication, use of antihypertensive medication, current smoking status, number of cigarettes smoked per day, diabetes mellitus status, body mass index, prior non-fatal myocardial infarction, prior congestive heart failure diagnosis, presence of electrocardiographic left ventricular hypotrophy, QRS duration >100 milliseconds, and presence of T-wave abnormality. We also considered including low-density lipoprotein cholesterol, glucose, and triglycerides, but these were excluded since each of these variables had greater than 10% missingness in participants who experienced sudden cardiac death. After these exclusions, a total of 11,335 ARIC (53% female) and 5,626 Framingham (52% female) participants were included in the variable selection step.

In ARIC, total and high density lipoprotein cholesterol were measured using enzymatic methods previously described.¹³ Medication use was based on self-reported use during the

two weeks prior to the examination.¹⁴ Race, cigarette use, and smoking status were also self-reported. Systolic and diastolic blood pressure were computed as the average of the final two readings following a five-minute rest.¹⁵ A T-wave abnormality was defined as having Minnesota codes 5-1, 5-2, 5-3, or 5-4.¹⁶ Electrocardiographic left ventricular hypotrophy was defined using Cornell voltage criteria.¹⁷ Prolonged QRS duration was determined from a 12-lead electrocardiogram. Diagnosis of non-fatal myocardial infarction or congestive heart failure prior to baseline were derived from medical records and self-reported use of heart failure medication for congestive heart failure. Diabetes was defined as the use of insulin or hypoglycemic agents or a fasting blood glucose of ≥ 126 mg/dL. Body mass index (kilograms/meters²) was calculated using weight and height at baseline.

In Framingham, current smoking status and number of cigarettes smoked per day at baseline were self-reported. Systolic blood pressure and diastolic blood pressure values were the average of two separate readings taken by a physician.¹⁸ Fasting blood samples were drawn in ethylenediaminetetraacetic acid plasma for cholesterol measurements.¹⁹ Diabetes was defined as insulin or hypoglycemic agents use or a fasting blood glucose of ≥ 126 mg/dL or casual glucose of ≥ 140 mg/dL if fasting glucose was unavailable. Lipid-lowering and antihypertensive medication use were self-reported. Diagnosis of non-fatal myocardial infarction or congestive heart failure prior to baseline were obtained from visit records prior to the 11th examination (the baseline exam in the present study) for FHS and via self-report and medical records for FOF participants. Twelve-lead electrocardiograms were obtained on all participants.²⁰ Participants had electrocardiograms classified as with or without a definite existence of nonspecific T-wave abnormalities.²¹ Electrocardiographic left ventricular hypotrophy was defined by at least one of the following: R wave > 1.1 mV in aVL; R wave > 2.5 mV in V5 or V6; S wave > 2.5 mV in V1 or V2; sum of S in V1 or V2 plus R in V5 or V6 > 3.5 mV; or sum of R in I and S in III > 2.5 mV.^{22,23} A prolonged QRS duration was defined as > 100 milliseconds.

In ARIC, deaths were reviewed using coroner records, death certificates, and through contacting kin or primary physician.¹⁰ Sudden cardiac death was defined as death resulting from fatal myocardial infarction or definite or possible fatal coronary heart disease where the time between symptom onset and death is less than one hour or where the time between hospital admission and death is less than one hour.²⁴ In Framingham, sudden cardiac death was defined as death resulting from coronary heart disease (definite myocardial infarction, coronary insufficiency, or angina pectoris) within one hour of symptom onset with no other probable cause of death suggested from the medical record and interview of relatives.²⁵ Suspected sudden cardiac death events were adjudicated by a panel of three trained physicians who applied criteria for sudden cardiac death.^{25,26}

We derived race-specific (black and white) risk scores for the 10-year risk of sudden cardiac death using Cox proportional hazards regression to estimate coefficients. We derived sex-specific scores, but since the number of sudden cardiac death events in men and women separately were small, we present a single sex-adjusted risk score by race. All analyses were performed using SAS 5.1 (SAS Institute, Cary, NC).

We derived a risk score specific to whites using data at baseline among white ARIC participants for variable selection and coefficient derivation and validated it within the Framingham cohort. We employed a stepwise regression technique using Akaike Information Criteria (AIC) to select variables. AIC uses a maximized likelihood function and the number of parameters in a model to compute a value representing the tradeoff between the goodness-of-fit and overfitting. We sequentially added one covariate to the model based on a stepwise algorithm to generate a list of AICs and picked the number of covariates (m) at which AIC was minimized.²⁷ Then, a local search was conducted for the maximized likelihood function among all m -sized combinations of variables. Finally, the selected covariates were used to fit a final model and variables that had a p -value > 0.15 were dropped. We validated the effectiveness of our model, that was fitted using ARIC participant data, for satisfactory calibration and discrimination in Framingham participants. Coefficients were recalibrated for black ARIC participants using the variables that were selected during the derivation and validation process among white participants within ARIC and Framingham. Because there are no black participants in Framingham, we were unable to externally validate this score. The proportional hazards assumption was verified for each covariate in the final model.

Discrimination of the final model was assessed using Harrell's c -index, which was first described by Harrell and further derived by Pencina and D'Agostino.^{28,29} Participants were divided into deciles by mean predicted probability of sudden cardiac death; for each decile, the mean predicted probability was compared to the observed Kaplan Meier estimate of sudden cardiac death. Calibration of the model was assessed using a Hosmer-Lemeshow chi-square test adapted to compare the Kaplan-Meier estimate and the mean predicted probability within each decile.³⁰ To ensure we chose a model that validated best externally, we repeated the entire procedure, deriving a model among Framingham participants and validating this model in ARIC participants (Supplementary Table S1–S2 and Supplementary Figure S1–S2).

As a comparative analysis, we assessed discrimination and calibration in the prediction of sudden cardiac death using non-sudden cardiac death specific cardiovascular risk scores. We considered the Adult Treatment Panel III modified Framingham Risk Score (FRS-ATPIII) for the prediction of 10-year risk for hard coronary heart disease,³¹ a general cardiovascular risk score derived from Framingham Heart Study (FRS-2008),³² and Pooled Cohort Equations for 10-year prediction of Atherosclerotic Cardiovascular Disease (PCE-ASCVD).³³

RESULTS

Baseline characteristics of ARIC and Framingham participants, stratified by sudden cardiac death outcome status, are displayed in Table 1. A total of 145 sudden cardiac deaths (34.5% among black participants) occurred over 10 years follow-up in the ARIC cohorts from 11,335 participants. In Framingham, there were 64 sudden cardiac deaths among the 5,626 participants. Several covariates had similar distributions among Framingham and ARIC participants experiencing sudden cardiac death within 10 years, including age, sex, and total cholesterol. However, differences included mean baseline systolic and diastolic blood

pressure was higher among Framingham participants experiencing sudden cardiac death compared with ARIC sudden cardiac death victims (142/84 mmHg vs. 129/73 mmHg), which also corresponded to a higher rate of antihypertensive medication use among ARIC sudden cardiac death victims (47.4% vs. 12.3%). Smoking prevalence at baseline was higher among Framingham sudden cardiac death victims compared to ARIC victims (40.0% vs. 30.8%). A higher proportion of Framingham sudden cardiac death victims had documented prior non-fatal myocardial infarction or congestive heart failure (24.9% vs. 3.3%), T-wave abnormality (19.4% vs. 8.9%, and ECG left ventricular hypertrophy (10.4% vs. 1.1%), but a lower proportion had a QRS duration >100 milliseconds (10.5% vs. 36.3%). Eight variables were selected for the risk score: age, sex, total cholesterol, lipid-lowering medication use, hypertension medication use, systolic blood pressure, diastolic blood pressure, smoking status, diabetes mellitus, and body mass index; model coefficients are presented in Table 2. Instructions on how to calculate the risk score for an individual are available in the Supplemental Methods.

The c-index for the final model among white ARIC participants was 0.82 (95% CI: 0.78–0.85), and among black participants was 0.75 (95% CI: 0.68–0.82), indicating excellent discrimination. The model demonstrated very strong calibration among white (X^2 :5.3, p-value: 0.82) and black (X^2 :4.1, p-value: 0.77) ARIC participants (Figure 1). Notably, participants in the highest deciles of predicted sudden cardiac death risk were at significantly higher risk compared with other strata and experienced the majority of observed events. Designating the upper quintile of predicted risk as a dichotomous classification mechanism yielded sensitivity of 65% and specificity of 80.5%.

When validated among white Framingham participants, the c-index was 0.82 (95% CI: 0.79–0.86), indicating very good discrimination. External calibration was poorer (X^2 : 29.7, p-value: <0.001) (Figure 2), largely as a function of differential overall event rates. Using the highest decile of predicted risk, sensitivity for sudden cardiac death was 45% and specificity was 87% in Framingham. We re-calibrated the model to determine the optimal covariate coefficients for Framingham participants (Supplemental Table S3). The c-index for this recalibrated model was 0.84 (95% CI: 0.80–0.87) and calibration of the refitted model (Figure 2) was notably improved (X^2 : 2.11, p-value: 0.99).

For comparison, C-indices and Hosmer–Lemeshow test χ^2 for the prediction of sudden cardiac death when using generalized cardiovascular risk scores are reported in the Supplemental Table S4. C-indices (indicating discrimination) for the Framingham coronary risk score, the Pooled Cohort Equations, and the Framingham Generalized Cardiovascular Disease risk equations were similar to the proposed sudden cardiac death risk score (0.80, 0.81, and 0.82, respectively). However, calibration for these risk scores was poor (χ^2 p-value <0.01 for all risk scores) (Supplemental Figures S3–S6). For each of these scores, observed and predicted average risk did not correlate well, indicating poor calibration. For example, in Figure S4, the highest decile has an average predicted risk of 29%, but the observed average risk is 2%. Those in the highest quintile have approximately the same average observed risk but the predicted risk is significantly larger in the highest decile when compared to the next highest decile (29% vs. 17%), indicating a lack of specificity when predicting sudden cardiac death using this score. However, observed and predicted average risk strongly

correlate when using the sudden cardiac death risk score to predict sudden cardiac death (S3), reflecting the sudden cardiac death risk score's strong calibration and specificity for the endpoint of interest.

DISCUSSION

Sudden cardiac death is a major cause of death in the United States and is a public health concern because the majority of sudden cardiac deaths occur among those without prior symptoms yet have undiagnosed subclinical coronary heart disease. Additionally, it is challenging to develop consistent treatment and response policies for sudden cardiac death due to multiple factors that influence outcomes post-event. The development of a risk score that uses clinical variables to screen high-risk individuals who may be asymptomatic is therefore critical to improve overall survival.

Risk scores have been developed for outcomes that include sudden cardiac death, including general cardiovascular outcomes³² and acute coronary events.³⁴ Additionally, risk scores for sudden cardiac death have been developed within at-risk populations such as young adults with hypertrophic cardiomyopathy³⁵ in populations with significant coronary artery disease³⁶, and for patients with ischemic left ventricular dysfunction.⁷ Individual risk stratification factors have been identified in the general population,³⁷ and the relative risks of sudden death given risk factors have been reported in the Paris Prospective Study.³⁸ Only one proposed score, reported by Deo et al.⁹, has been derived in a general community-based study, but requires inputs of serum potassium, serum albumin, estimated glomerular filtration rate, and QT_c interval to calculate sudden cardiac death risk. Our investigation developed a risk scoring tool in the general population using easily obtained clinical measures. Given the publication and dissemination of other general-population risk profiles such as the Framingham Risk Score for General Cardiovascular Disease³², this study examined whether a similar score with acceptable calibration and discrimination could be developed and validated using samples from the general population. Our findings demonstrate that it may be unnecessary to include factors such as those included in the recently published models⁹, which may not be readily available or known by an otherwise healthy individual, for developing a sudden cardiac death risk score. Furthermore, our results show a similar level of discrimination and calibration within the same derivation cohort.

Our derived risk equation for sudden cardiac death has excellent internal and external discrimination: the c-index of 0.82 in ARIC and 0.82 in Framingham are very strong; by comparison, the c-index reported by Deo et al. was 0.82 in ARIC and 0.75 in the Cardiovascular Health Study,⁹ and the c-index for a general cardiovascular disease risk profile score was 0.76 (men) and 0.79 (women). Calibration in ARIC was also very strong and the decile of participants with the highest predicted mean risk of sudden cardiac death had a substantially higher mean predicted and actual sudden cardiac death probability compared to other deciles, indicating that the highest decile of predicted risk might be useful for identifying patients for additional screenings and justify cost-effective therapies that can prevent sudden cardiac death. A cost-effective and effective strategy will likely comprise sequential testing after stratifying those at the highest risk using our proposed risk score equation. Further studies would be useful for developing such a sequential testing strategy,

including identifying risk factors and tests that are most effective at discriminating those in the highest risk group, and enrolling those individuals in clinical trials for therapeutic or pharmacologic interventions.

Both ARIC and Framingham are community-based cohorts that have ascertained sudden cardiac death outcomes, and the resulting risk score has strong discrimination in the modeled and validating population. Additionally, all factors used in the final risk score are easily obtained non-invasively in a clinical setting.

Study Limitations

There are several limitations to this study. Both Framingham cohorts were primarily white, so validation was limited to white participants within Framingham. However, we are actively validating both race-specific risk scores within the REGARDS Study.³⁹ Similarly, as ARIC participants were aged 45–64 at baseline, future studies will need to be conducted to examine the generalizability of our risk score in older and younger cohorts. The baseline data in Framingham were ascertained up to 22 years prior to those of the baseline ARIC visit, which may explain differences in population characteristics but also may influence the results that we reported when validating our score on Framingham participants. Furthermore, while the rarity of sudden cardiac death introduces challenges for deriving predictive models, we used AIC during variable selection to balance covariate selection while protecting against overfitting. Finally, while discrimination was still excellent when externally validated, we observed less acceptable calibration using the original coefficients, although recalibration achieved excellent calibration in the external population. Calibration in Framingham could have been weaker for several reasons, including the relatively high probability of sudden cardiac death in Framingham compared to ARIC, and the difference in the prevalence of several risk factors that are associated with those used in the risk score in either study (such as increased hypertension medication use in ARIC, higher average systolic blood pressure in Framingham, and higher prior myocardial infarction/congestive heart failure prevalence in Framingham). As Harrell²⁸ notes, developing a model with strong discrimination is more important than one that has strong calibration, as models can usually be recalibrated to new populations, and this is especially true when the purpose of the model is to make a dichotomous decision.

CONCLUSIONS

For the ARIC model, predicted and observed events increased sharply in the two highest deciles. This finding indicates that a very high risk group among the general population may be identified using our risk score for additional screenings (e.g. echocardiogram, electrocardiogram), or targeted therapies for sudden cardiac death. In the United States, routine screening is recommended for other diseases, including colon cancer, breast cancer, cervical cancer, and lung cancer among smokers. The number of deaths from sudden cardiac death in the United States is higher than for those diseases, but there are no sudden cardiac death screening guidelines. The present risk score represents an initial step in developing routine screening for sudden cardiac death.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Clinical Significance

- The number of deaths in the United States from sudden cardiac death is higher than for diseases with routine screening recommendations, but there are no sudden cardiac death screening guidelines.
- Our risk score uses routinely measures characteristics to estimate the 10-year risk of sudden cardiac death.
- A very high risk group among the general population may identified using our risk score for additional screenings or targeted therapies for sudden cardiac death.

Figure 1.

Calibration of the SCD Risk Score for white (left) and black (right) ARIC participants, using coefficients derived from the ARIC population. Observed (red) and predicted (blue) mean 10-year risk of sudden cardiac death rates are shown, stratified by decile of predicted risk. Note that fewer than 10 distinct groups are displayed for black-specific risk score calibration, as we required each group to have at least 3 events.

Figure 2.

(left) Calibration of the white-specific sudden cardiac death risk score among Framingham participants, using coefficients derived from the ARIC population, and (right) Recalibration of the sudden cardiac death risk score among white Framingham participants. Observed (red) and predicted (blue) mean 10-year risk of sudden cardiac death rates are shown, stratified by decile of predicted risk.

Table 1

Candidate Covariates for White Atherosclerosis Risk in Communities and Framingham Heart Study participants at baseline, stratified by sudden cardiac death within 10 years.

Covariate	ARIC (N=11335)		Framingham (N=5626)	
	No sudden cardiac death N=11240	Sudden cardiac death N=95	No sudden cardiac death N=5562	Sudden cardiac death N=64
Age, years (SD)	54.4 (5.7)	57.4 (5.0)	48.1 (11.2)	58.6 (8.4)
Female, %	52.6%	26.4%	53.2%	22.4%
Total Cholesterol, mg/dL (SD)	215 (41)	234 (47)	214 (43)	240 (43)
High density lipoprotein Cholesterol, mg/dL (SD)	50 (17)	40 (12)	52 (15)	44 (12)
Lipid-Lowering Treatment, %	3.4%	6.7%	1.3%	7.5%
Systolic blood pressure, mmHg (SD)	118 (17)	129 (19)	130 (20)	142 (22)
Diastolic blood pressure, mmHg (SD)	71 (10)	73 (12)	81 (11)	84 (11)
Anti-hypertension Treatment, %	20.0%	37.4%	5.8%	12.3%
Current smoker, %	25.1%	30.8%	40.1%	40.0%
Body mass index, kg/m ² (SD)	27.0 (4.9)	29.1 (6.3)	26.0 (4.2)	26.2 (3.6)
Electrocardiogram Left Ventricular Hypertrophy, %	2.2%	1.1%	1.3%	10.4%
Prior nonfatal myocardial infarction/congestive heart failure, %	4.4%	3.3%	2.4%	24.9%
T-wave abnormality, %	13.9%	8.9%	7.0%	19.4%
Cigarettes/day among current smokers, No. (SD)	20.3 (12.4)	21.4 (14.4)	12.4 (15.4)	12.2 (15.7)
Diabetes, %	9.2%	31.9%	13.9%	25.4%
QRS duration >100 milliseconds %	33.4%	36.3%	1.8%	10.5%

SD: standard deviation.

Table 2

10-year sudden cardiac death risk score regression coefficients, baseline survival function (S_0), and mean value. The 10-year risk for whites can be calculated as $1 - 0.99538^{\exp(\sum \beta X - 8.19637)}$, and for blacks as $1 - 0.99153^{\exp(\sum \beta X - 6.08333)}$ where β is the regression coefficient and X is the value of the risk factor (see Supplementary Methods for an example).

Risk Factors	White		Black	
	β	Hazards Ratio (95% CI)	β	Hazards Ratio (95% CI)
Age, yr	0.067	1.069 (1.038, 1.101)	0.066	1.068 (1.029, 1.107)
Female	-1.262	0.283 (-0.064, 0.63)	-1.038	0.354 (-0.093, 0.801)
Total Cholesterol, mg/dL	0.008	1.008 (1.004, 1.012)	0.005	1.005 (1.001, 1.009)
Lipid-Lowering Medication Use	0.444	1.559 (0.961, 2.157)	0.513	1.67 (0.512, 2.829)
Hypertension Medication Use	0.307	1.359 (1.02, 1.698)	0.785	2.192 (1.757, 2.628)
Systolic blood pressure, mmHg	0.025	1.025 (1.016, 1.035)	0.017	1.017 (1.005, 1.029)
Diastolic blood pressure, mmHg	-0.024	0.976 (0.957, 0.996)	-0.005	0.995 (0.973, 1.017)
Current smoker	0.617	1.853 (1.512, 2.194)	0.231	1.26 (0.807, 1.713)
Diabetes	0.787	2.197 (1.834, 2.559)	0.922	2.514 (2.064, 2.965)
Body mass index, kg/m ²	0.074	1.077 (1.047, 1.106)	-0.009	0.991 (0.952, 1.03)
$S_0(10)$	0.99538		0.99135	
Mean $\sum \beta X$	8.19637		6.08333	