

Family History of Stroke and Cardiovascular Health in a National Cohort

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Background: We investigated the association between family history of stroke (FHS) and Life's Simple 7 (LS7), a public health metric defined by the American Heart Association. *Methods:* Reasons for Geographic and Racial Differences in Stroke is a national population-based cohort of 30,239 blacks and whites, aged 45 years or older, sampled from the US population between 2003 and 2007. Data were collected by telephone, mail questionnaires, and in-home examinations. FHS was defined as any first-degree relative with stroke. Levels of the LS7 components (total cholesterol, blood pressure, fasting glucose, physical activity, diet, smoking, and body mass index) were each coded as poor (0 points), intermediate (1 point), or ideal (2 points) health. Ordinal logistic regression was used to model the data. *Results:* Among 20,567 subjects with complete LS7 and FHS data, there were 7702 (37%) participants with an FHS. The mean age of the participants was 64 years. The mean (\pm standard deviation) overall LS7 score was lower for blacks (6.5 ± 2.0) than that of whites (7.6 ± 2.1). FHS was associated with poorer levels of physiological factors, particularly high blood pressure (odds ratio [OR], 1.13; 95% confidence interval [CI], 1.07-1.19) and inversely associated with behaviors such as smoking (OR, .92; 95% CI, .85-.99). *Conclusions:* Our results suggest that screening for FHS can provide an opportunity for earlier detection and management of modifiable risk factors. **Key Words:** Family history of stroke—risk factors—Life Simple 7—Racial Differences—Cohort Study.

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Effectiveness of health programs can be increased by interventions targeted at high-risk individuals.^{1,2} An important and readily accessible source of risk

information in an individual is their family history. Family history represents the integration of shared genetic and environmental risk factors and could be used

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as a screening tool for individuals with increased disease risk including cardiovascular diseases.³⁻⁸ Family history of stroke (FHS) is a recognized risk factor for stroke events although its importance has not been conclusively confirmed by epidemiologic studies.^{9,10} Familial aggregation of stroke appears to be caused by a strong association of conventional stroke risk factors, such as hypertension, diabetes, and dyslipidemia, between parents and offspring as previously demonstrated in the Reasons for Geographic and Racial Differences in Stroke (REGARDS) population.¹¹ As yet, there is limited data on the association of FHS and health behaviors.

Many risk factors for stroke are under genetic influence, and a considerable degree of heritability appears to be conferred by intermediate phenotypes. The American Heart Association (AHA) and American Stroke Association have proposed a public health metric, Life's Simple 7 (LS7), that consists of 7 modifiable components, including 3 physiological factors (total cholesterol, blood pressure, and fasting glucose) and 4 health behaviors (physical activity, healthy diet, smoking, and body mass index [BMI]) and categorizes them into ideal, intermediate, and poor levels.¹² Recent studies have demonstrated strong association of LS7 with incident stroke.¹³ The relationship between FHS and an overall intermediate phenotype like the AHA's cardiovascular health index (LS7) has not been comprehensively evaluated. Furthermore, there are few studies that address this issue in blacks, a group at higher stroke risk than whites in the United States. In this study, we examined the association of FHS with cardiovascular physiological risk factors, health behaviors, and an overall phenotype (LS7) in a large, population-based, national cohort study. We hypothesized that people with a positive FHS would have a lower prevalence of ideal physiological factors and ideal health behaviors than those without FHS.

Methods

Study Participants

REGARDS study is a national, population-based cohort study investigating racial and geographic disparities in stroke and cognitive decline among black and white US adults of 45 years or older.¹⁴ The study was designed to oversample blacks and to provide approximate equal representation of men and women. Residents from the southeastern United States were oversampled and represent 56% of the cohort with the remaining 44% of participants recruited from the rest of the continental United States. Potential participants were identified from commercially available lists of US residents and recruited through an initial mailing followed by telephone contacts. Overall, 30,239 participants were enrolled between January 2003 and October 2007; the sample included 45% men and 55% women and 58% whites and 42% blacks. The REGARDS study protocol was approved by the institutional

review boards' governing research in human subjects at the participating centers, and all participants provided informed consent.

Data Collection

Sociodemographic and clinical data were collected at baseline through a telephone interview, self-administered questionnaires, and an in-home examination. Trained interviewers conducted computer-assisted telephone interviews to obtain information on participant's demographics, socioeconomic factors, and medical history including the use of antihypertensive, diabetes, and cholesterol-lowering medications. After the telephone interview, trained health professionals conducted an in-home study visit that included a physical examination, electrocardiogram, and the collection of blood and urine samples. Self-administered questionnaires were left with the participant to complete and return by mail. These included the Block 98 Food Frequency Questionnaire^{15,16} and a Family History Questionnaire asking whether the first-degree relatives (biologic parents and siblings) ever had a stroke. FHS was considered positive if at least 1 parent or 1 sibling had a stroke. Ischemic and hemorrhagic stroke were not identified separately. Using the Food Frequency Questionnaire, each participant recorded food intake for 1 year before their in-home visit. Nutrient analysis was conducted by NutritionQuest.

Life's Simple 7

Components of LS7 include cigarette smoking, physical activity, diet, BMI, blood pressure, total cholesterol, and fasting glucose. These components are categorized as being poor, intermediate, or ideal as per AHA guidelines (Table 1).¹⁷ Current and former smoking and time since smoking cessation for former smokers were determined by participant questions. Physical activity was assessed through a single question "How many times per week do you engage in intense physical activity, enough to work up a sweat?" Height and weight were measured using calibrated equipment, and BMI was calculated. The diet score for the LS7 was based on fish, fruit, and vegetable consumption and sodium, sugar, and fiber/carbohydrate ratio intake. An ideal diet was defined by the following 5 factors: fish consumption of 2 or more servings/wk, fruit/vegetables of 4.5 or more cups/d, sodium intake less than 1500 mg/d, sugar less than 450 kcal/wk, and fiber/carbohydrate ratio greater than .1 as per recommendations of the new metric. Systolic and diastolic blood pressures were measured 2 times using aneroid sphygmomanometers following a standardized protocol. The 2 blood pressure measurements were averaged for the current analyses. Total cholesterol was measured using an enzymatic reaction. Glucose was measured in serum using colorimetric reflectance spectrophotometry.

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