# Comparison of Risk of Atrial Fibrillation Among Employed Versus Unemployed (from the REasons for Geographic and Racial Differences in Stroke Study)

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**Involuntary unemployment due to job loss has been associated with increased risk of cardiovascular events. Whether it also is associated with increased risk of atrial fibrillation (AF) is currently unknown. Therefore, we examined this association in 8,812 participants residing mainly in the Southeastern United States (mean age 58.1 ± 7.8 years; 63.2%; women; 43.2% black) with data on employment status who were enrolled in the REasons for Geographic And Racial Differences in Stroke study between 2003 and 2007 after excluding those with voluntary unemployment (retiree, homemakers, and students). AF was identified by electrocardiogram and past medical history at the same period. The cross-sectional association between status and type of unemployment with AF was examined in multivariable logistic regression models. Additional analysis in 4,273 participants without baseline AF and with data on incident AF collected in a follow-up visit occurred after a median of 9.4 years from baseline was also conducted. In a model adjusted for socio-demographics, health insurance, income, perceived stress, and cardiovascular risk factors, unemployment was associated with 60% increased odds of AF (odds ratio [95% confidence interval] 1.60 (1.24, 2.07)). This association was consistent in subgroups stratified by median age, gender, race, education, income, and health insurance status. Similarly, unemployment was associated with AF in those without AF at baseline who developed incident AF (odds ratio [95% confidence interval] 1.54 (1.04, 2.37)). In conclusion, involuntary unemployment is associated with increased risk of AF. This may call for considering socioeconomic determinants such as unemployment as part of the preventive strategies for AF.**  **(Am J Cardiol 2017;120:1298–1301)**

Employment instability affects an increasing number of adults in the United States. The psychological stress that comes with involuntary job loss or inability to find a job (i.e., unemployment) has significant long-term consequences on cardiovascular health.[1] Previous reports have shown that unemployment and job loss are significant risk factors for acute cardiovascular events, including myocardial infarction and stroke.[2–4] Whether unemployment is associated with increased risk of atrial fibrillation (AF) as well is currently unknown. Psychological stress has been implicated as a risk factor for AF,[5–7] and hence it is possible that unemployment predisposes to development of AF. Looking for new modifiable risk factors for AF is becoming of significant importance from the public health perspective because its prevalence is expected to double by 2050.[8] Therefore, we sought to examine the association between involuntary unemployment and AF in the REasons for Geographic And Racial Differences in Stroke (REGARDS) study.

## Methods

The goals and design of the REGARDS study, a U.S. national longitudinal study, have been published. REGARDS was designed to investigate causes of regional and racial disparities in stroke mortality, oversampling blacks and residents of the Southeastern states "stroke belt region."[9] Subjects were recruited from a commercially available list of residents using mail and telephone contact. Demographic information and medical history including perceived stress measured by the Cohen Perceived Stress 16-point Scale[10] were obtained by telephone interview. All methods were approved by Institutional Human Subjects Review Boards. A brief physical examination was conducted 3 to 4 weeks after the telephone interview, including standardized measurements of risk factors, collection

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Funding Support: This research project is supported by a cooperative agreement U01 NS041588 from the National Institute of Neurological Disorders and Stroke, National Institutes of Health, Department of Health and Human Service. The authors thank the other investigators, the staff, and the participants of the REGARDS study for their valuable contributions. A full list of participating REGARDS investigators and institutions can be found at http://www.regardsstudy.org.

See page 1301 for disclosure information.

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0002-9149/
http://dx.doi.org/10.1016/j.amjcard.2017.07.001

of blood and urine, and recording of resting electrocardiogram (ECG).

Of 30,239 REGARDS participants enrolled between 2003 and 2007, employment status was evaluated in 18,800 REGARDS participants. Participants were specifically asked: "Are you currently employed for wages, self-employed, out of work for >1 year, out of work for <1 year, a homemaker, a student, retired, or unable to work?" For the purpose of this analysis, we excluded those who refused to answer (n = 9) and unemployed voluntarily (retired (n = 8,655), homemaker (n = 1,046), and student (n = 47)), as well as those with missing AF data (n = 231).

AF was identified in study participants at baseline by the scheduled ECG and also from self-reported history of a physician diagnosis during the computer-assisted telephone interview surveys. The ECGs were read and coded at a central reading center by electrocardiographers who were blind to other REGARDS data. Self-reported AF was defined as an affirmative response to the following question: "Has a physician or a health professional ever told you that you had atrial fibrillation?"[11]

The cross-sectional association between status and type of unemployment with AF was examined in multivariable logistic regression models. Multivariable models were constructed with incremental adjustments as follows: model 1 adjusted for age, gender, race, region of residence, and education level; model 2 adjusted for model 1 covariates plus income and insurance status; model 3 adjusted for model 2 covariates plus perceived stress; model 4 adjusted for model 3 plus systolic blood pressure, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, body mass index, smoking status, diabetes, blood pressure lowering medications use, lipid-lowering medications use, history of coronary heart disease, history of stroke, high-sensitivity C-reactive protein levels, albumin-to-creatinine ratio, history of heart failure, history of stroke, and electrocardiographic left ventricular hypertrophy using Sokolow-Lyon criteria. Additional analysis in those without baseline AF and with data on incident AF collected during REGARDS second in-home visit was also conducted.

## Results

This analysis included 8,812 participants residing mainly in the Southeastern United States (mean age 58.1 ± 7.8 years; 63.2%; women; 43.2% black). Hypertension, dyslipidemia, and diabetes were common (prevalence 52.2%, 54.5%, and 19.5%, respectively), and most participants (88.6%) had health insurance. Unemployed participants (total n = 2,095; out of work >1 year n = 295; out of work <1 year n = 287; unable to work n = 1,513) were more likely to be slightly older, women, black, with lower levels of socioeconomic markers, and higher prevalence of cardiovascular risk factors compared with employed participants (total n = 6,717; employed for wages n = 5,009; self-employed n = 1,708) (Table 1).

AF was detected in 673 (7.6%) participants (13.4% in unemployed vs 5.8% in employed; p value <0.001). In a sociodemographic model, unemployment was associated with more than double the odds of AF. This association was attenuated to be 60% (p <0.001) by further adjustment for health insurance, income, perceived stress, and cardiovascular risk factors (Table 2). These results were consistent in subgroups stratified by median age (57 years), gender, race, education, income, and health insurance status (Figure 1). Compared with the employed participants, the highest odds of AF were observed in those unable to work, then lost job for less than a year then lost job for more than a year (odds ratio (95% confidence interval) (OR (95% CI) 1.77 (1.33, 2.36); 1.45 (0.84, 2.49); 1.09 (0.61, 1.93), respectively; trend p-value <0.01).

In additional analysis limited to 4,273 participants without AF at baseline and with follow-up data, AF (n = 227) developed more often during a median follow-up of 9.4 years in the unemployed compared with the employed (6.4% vs 5.1%, p <0.001). The OR (95% CI) was 1.73 (1.15, 2.58) in the

Table 1
Characteristics of the study participants by employment status

| Characteristic | Unemployed (n = 2095) | Employed (n = 6717) | p-Value |
|---|---|---|---|
| Age (years) | 58.6 ± 7.8 | 58.0 ± 7.8 | 0.002 |
| Women | 68.1% | 61.7% | <0.001 |
| Black | 55.0% | 34.7% | <0.001 |
| Region of residence* | | | <0.001 |
| Stroke Belt | 37.6% | 34.7% | |
| Stroke Buckle | 29.4% | 25.4% | |
| Non-belt | 33.1% | 39.9% | |
| Education | | | <0.001 |
| High school or less | 49.4% | 22.4% | |
| Some college | 30.8% | 28.1% | |
| College graduate and above | 19.8% | 49.5% | |
| Annual income | | | <0.001 |
| ≤$20k | 41.6% | 7.6% | |
| $20k to $74k | 37.3% | 54.3% | |
| ≥$75k | 4.8% | 29.5% | |
| Refused to answer | 16.3% | 8.7% | |
| Health insurance | 82.8% | 90.3% | <0.001 |
| Perceived stress score† | 5.2 ± 3.4 | 3.1 ± 2.6 | <0.001 |
| Smoker | | | <0.001 |
| Current | 26.5% | 14.8% | |
| Past | 33.1% | 33.6% | |
| Body mass index (kg/m$^2$) | 31.7 ± 7.8 | 29.6 ± 6.2 | <0.001 |
| Diabetes mellitus | 34.1% | 14.0% | <0.001 |
| Systolic blood pressure (mm Hg) | 126 ± 16.6 | 123.0 ± 15.1 | <0.001 |
| Blood pressure lowering medications use | 67.2% | 47.3% | <0.001 |
| Left ventricular hypertrophy | 9.8% | 6.3% | <0.001 |
| LDL-cholesterol (mg/dL) | 113.7 ± 37.5 | 116.6 ± 34.4 | 0.002 |
| HDL-cholesterol (mg/dL) | 51.3 ± 15.8 | 53.1 ± 16.2 | 0.002 |
| Lipid-lowering medication use | 35.7% | 25.8% | <0.001 |
| Log(hs-CRP) (mg/L) | 1.2 ± 1.2 | 0.70 ± 1.2 | <0.001 |
| Log (ACR) (mg/g) | 2.6 ± 1.5 | 2.1 ± 1.0 | <0.001 |
| Prior coronary heart disease | 21.4% | 9.5% | <0.001 |
| Prior stroke | 12.3% | 2.2% | <0.001 |
| Prior heart failure | 21.4% | 8.0% | <0.001 |

ACR = urine albumin-to-creatinine ratio; HDL = high-density lipoprotein; LDL = Low-density lipoprotein; hs-CRP = high-sensitivity C-reactive protein.

* Stroke Belt (southeast states of North Carolina, South Carolina, Georgia, Tennessee, Alabama, Mississippi, Louisiana, and Arkansas) Stroke Buckle (coastal plains of North Carolina, South Carolina, and Georgia).

† Perceived stress was measured by the Cohen Perceived Stress 16-point Scale.