

## Racial Disparities in Risks of Stroke

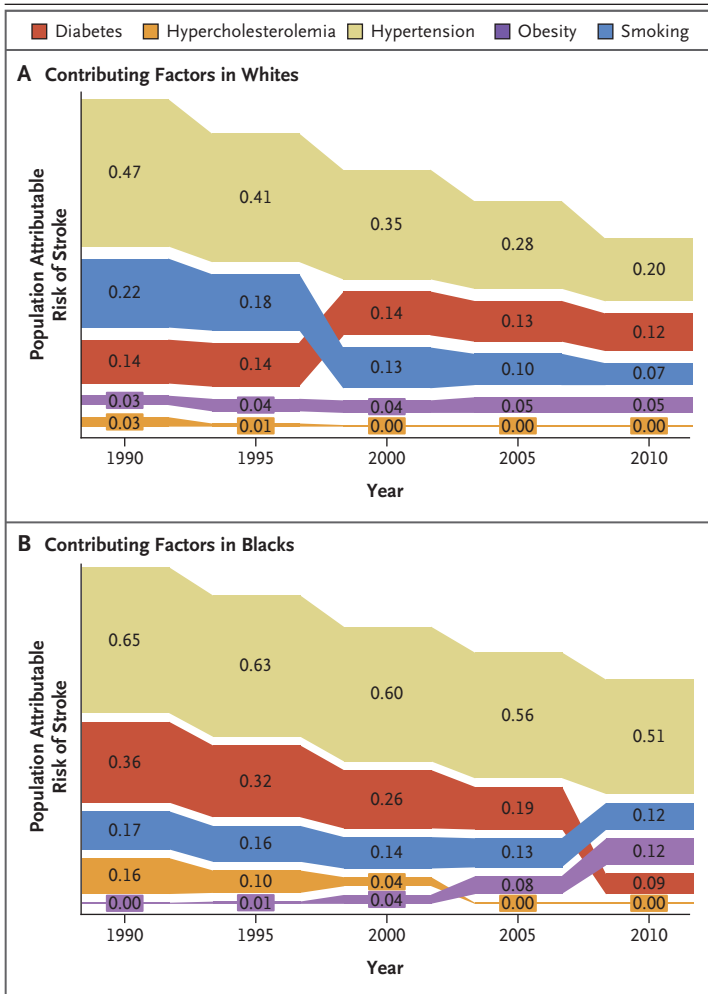
**TO THE EDITOR:** The incidence of stroke in the United States has been decreasing as efforts have been made to control vascular risk factors.<sup>1</sup> However, the extent to which modifications in changes in the risk of stroke have occurred in blacks as compared with whites has not been widely studied.

We examined age-adjusted trends in the contributions of major risk factors for stroke — hypertension, obesity, diabetes, hypercholesterolemia, and smoking — in the Atherosclerosis Risk in Communities cohort. The cohort consisted of four U.S. communities<sup>2</sup> that were followed from 1987 through 2013 (see the Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org) and included a total of 15,350 adults, 56% of whom were women and 26% of whom were black.<sup>3</sup> During the follow-up period (median, 24.3 years; interquartile range, 17.4 to 25.4), 1243 participants had new-onset stroke. The contributions of all risk factors combined decreased from year 1990 to year 2010 in the total sample (decrease in population attributable risk [PAR] from 73% to 41%;  $P=0.02$ ). This change corresponded with significant reductions in the PAR of hypertension ( $P=0.001$ ), smoking ( $P<0.001$ ), and diabetes ( $P=0.004$ ) (Fig. 1); occurred contemporaneously with increases in the use of antihypertensive, glucose-lowering, and cholesterol-lowering medications; and persisted after adjustment for the presence of atrial fibrillation. (Additional information can be found in Tables S1, S2, S3, and S4 in the Supplementary Appendix.)

However, in analyses stratified according to race, the contribution of all risk factors combined was associated with a greater decline in the risk of stroke from 1990 to 2010 among whites (decrease in PAR from 66% to 34%;  $P=0.07$ ) than among blacks (decrease in PAR from 84% to 63%;

$P=0.40$ ). The difference was largely due to a greater reduction in the PAR of hypertension among whites (from 47% to 20%;  $P=0.001$ ) than among blacks (from 65% to 51%;  $P=0.34$ ). This difference in PAR was driven by a greater decrease in the hazard ratio for hypertension among whites (hazard ratio, 2.9 [95% confidence interval (CI)], 2.0 to 4.2] to 1.4 [95% CI, 1.1 to 1.9];  $P<0.001$ ) than among blacks (hazard ratio, 3.8 [95% CI, 2.1 to 7.0] to 2.2 [95% CI, 1.1 to 4.1];  $P=0.20$ ). The contribution of smoking as a risk factor for stroke showed greater decreases among whites, whereas the contribution of diabetes showed greater decreases among blacks (Fig. 1). For most risk factors that contribute to the incidence of stroke, declining trends among men were similar to those among women (Fig. S1 in the Supplementary Appendix).

Our analyses of community data collected over the past two decades indicate that the contributions of major risk factors for stroke are decreasing, probably reflecting increasing awareness and treatment.<sup>4</sup> However, there has been a disparity between blacks and whites in the rates at which



**Figure 1. Contributions of Vascular Risk Factors to the Incidence of Stroke According to White or Black Race, 1990 to 2010.**

The rank order of risk factors from top to bottom is based on average values. Risk factors with similar values for population attributable risk have switched positions of influence at different time points. The height of each bar is proportional to the value for population attributable risk for a risk factor at each time point.

the contributions of risk factors for stroke have diminished, with the most striking difference observed in hypertension. Given the potential for interventions to modify the risk of stroke,<sup>5</sup> tar-

geted efforts to address particular risk factors may reduce the overall burden of stroke among blacks.

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