Is the Stroke Belt Worn From Childhood? 
Current Knowledge and Future Directions

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More than 4 decades ago, Borhani reported excess stroke mortality risk in the southeastern states of the US, the “Stroke Belt”. Since then, none of the many reasons proposed adequately explained the phenomenon. Many studies have failed to adequately explain geographic differences in stroke risk using traditional stroke risk factors measured later in life. There are 3 possible reasons why the traditional stroke risk factors failed to account for the higher stroke risk in the Stroke Belt states. First, the measurement of the risk factors may be inadequate. For example, higher blood pressure level, the most important single determinant of stroke risk, was measured in previous studies at only 1 or even several points in time, usually in middle aged or older adults. The integrated level of blood pressure from childhood or young adulthood to older ages and their adverse effects on vascular disease may be a more important determinant. Second, previous studies typically did not take into account the differential effects of treatment of the risk factors, not only including the likelihood that individuals are placed on various therapies to lower blood pressure or other risk factors but also, most important, adherence to such therapies and reduction of these risk factors. Third, there may be other still unidentified risk factors more prevalent in the southeastern states that make them carry this high risk of stroke mortality to their residents.

Supporting the concept of duration of exposure, we have previously reported in older individuals from the Cardiovascular Health Study that higher white matter grade on brain MRI, a marker of cumulative exposure and control of several stroke risk factors, explained 25% of the observed differences in stroke incidence among the 4 centers of the study. Another approach to evaluating the concept of duration of exposure is to evaluate whether earlier life exposures in the Stroke Belt states are associated with increased stroke risk. Using local state mortality data and 1990 US census data, a couple of US studies examined the relation between Stroke Belt early-life mortality data and 1990 US census data, a couple of US states that make them carry this high risk of stroke mortality.

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ment, and finally inadequate power of some subanalysis by sex and birth cohort.

The study by Glymour and colleagues\(^9\) is important in making a valuable contribution to our understanding of Stroke Belt etiology by suggesting that the determinants of high stroke risk probably begin in childhood. Unfortunately, the data cannot separate the above 3 critical hypotheses related to high stroke risk in the southeastern states. A next step, therefore, might be to focus efforts in trying to determine whether there are differences in stroke risk factors, particularly early onset ones, as well as micro- and macronutrients among children and young adults in the southeastern states compared with the rest of the nation. For example, there has been some suggestion that low birth weight,\(^{10,11}\) poor weight gain early in life\(^12\) and low parental socioeconomic status at the time of birth,\(^13\) as measures of prenatal and early postnatal nutritional and environmental exposures, may be associated with an excess risk of stroke. Moreover, dietary factors such as high salt intake or low intake of potassium\(^14\) in childhood and young adulthood may be associated with an earlier onset of elevated blood pressure which could be associated with greater subclinical vascular disease and consequently stroke risk later in life. Increased left ventricular hypertrophy, microalbuminuria, elevated creatinine and cystatin-C levels and microvascular retinopathy in the eye may all be markers for long-standing elevated blood pressure and should be evaluated in further studies. In summary, the findings from this study and previous and ongoing studies to explain high stroke risk in the southeastern US suggest that greater emphasis is needed in studying the evolution of vascular disease in high and low risk areas in children and younger adults.

**Disclosures**

None.

**References**


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