Where do we intervene to reduce the burden of the Stroke Belt?

George Howard, DrPH

UAB School of Public Health
Birmingham, AL

Background

- The Stroke Belt has been defined by a higher stroke mortality in the southeastern US
- But, there are two (quite different) reasons more people could be dying from stroke
  - More people having a stroke (incidence)
  - Higher chance of death among those having a stroke (case fatality)

    Mortality = incidence x case-fatality

Implications of Incidence vs. Case Fatality

- The reason for working to understand the cause of the stroke belt is to guide interventions
- However, if the Stroke Belt is "caused by:
  - Higher incidence?

    … then we need community-based interventions to reduce the risk of developing stroke
  - Worse case-fatality?

    … then we need hospital-based interventions to prove care following stroke

This work has already been reported

(But for obvious reasons I thought it would be of great interest here)

Neuro epidemiology

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Incidence and Case Fatality at the County Level as Contributors to Geographic Disparities in Stroke Mortality

Darwin R. Labarthe[a] George Howard[b] Monika M. Safford[d] Virginia J. Howard[c] Suzanne E. Judd[b] Mary Cushman[e] Brett M. Kissela[f] for the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Investigators

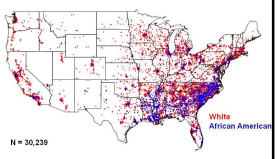
Study Goal

- **Using data from the REasons for Geographic And Racial Differences in Stroke (REGARD) study:**
  - **Confirm that there is higher stroke mortality (i.e., fatal stroke) in the Stroke Belt**
  - **If so, then assess if there is:**
    - **A higher chance of having a stroke in the stroke belt (i.e., incidence)?**
    - **A higher chance of dying of a stroke in the stroke belt (i.e., case fatality)**

Source of Data:

REasons for Geographic And Racial Differences in Stroke (REGARDS) Study

- **General population study**
- **Central participant recruitment and telephone interview**
  - **30,239 white and black participants aged 45+**
  - **56% from the Stroke Belt**
  - **42% black**
- **In-home evaluation for physical, venipuncture and ECG**
- **Central follow-up at 6-month intervals for detection of suspected stroke events (and other outcomes)**
- **Physician adjudication of stroke events**
- **Participants residing in 1,831 counties and 10,250 unique census tracks**



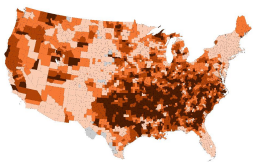
Methods

- Classify counties across the US into quartiles of stroke mortality (based on Vital Statistics)
  - Calculated separately for whites and black, and averaged
- Define death from stroke (an fatal stroke) as death within 30 days of an incident event
- Three age-sex adjusted analyses assessing the association of quartile of stroke mortality with:
  - Fatal stroke: proportional hazards analysis
  - Incident stroke (fatal or nonfatal): proportional hazards analysis
  - Case fatality: logistic regression

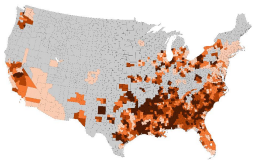
Primary Predictor: County-Level Mortality

(Six-Year Average: 2005-2010)

White



Black



	White (n = 3,082)
Q1:	27.0 – 78.9
Q2:	79.0 – 87.8
Q3:	87.8 – 98.4
Q4:	98.5 – 257.5

Description of the Population

		Quartile of County Stroke Mortality			
		Q1 (n = 7,357)	Q2 (n = 7,468)	Q3 (n = 7,395)	Q4 (n = 7,430)
Age (mean ± SD)		65.4 ± 9.4	65.1 ± 9.5	64.8 ± 9.4	64.3 ± 9.3
Male (%)		47.9	45.3	43.2	43.3
Black (%)		41.7	40.5	41.2	41.1
Region of the Nation (%)	Buckle	4.9	16.6	28.5	33.6
	Belt	11.9	34.7	40.4	51.6
	Rest of Nation	83.2	48.7	31.1	14.8

Number of Stroke Events within Quartile of Stroke Mortality

	All	Quartile of County Stroke Mortality			
		Q1	Q2	Q3	Q4
Number of Participants	29,650	7,357	7,468	7,395	7,430
Number of Stroke Events	1,317	317	320	315	365
Number of Fatal Stroke Events	242	46	68	41	77
Person-years exposure	205,917	52,615	51,913	50,993	50,396

Fatal Stroke, Incident Stroke and Case-Fatality by County Mortality

County-Level Stroke Mortality Quartile	Fatal Strokes	
	Rate/100,000 (95% CI)	Hazard Ratio (95% CI)
Quartile 1	90 (67 – 121)	1.00 (ref)
Quartile 2	140 (110 – 178)	1.55 (1.06 – 2.25)
Quartile 3	109 (82 – 144)	1.21 (0.81 – 1.81)
Quartile 4	174 (138 – 218)	1.95 (1.35 – 2.81)
p-trend	0.0025	

Discussion

- Population stroke mortality predicts study stroke mortality, validating associations
- Population stroke mortality is also related to both study stroke incidence
  - Relationship is "well-behaved"
  - However the increase in risk of stroke incidence is smaller than increase in mortality
- Population stroke mortality is marginally associated with case-fatality
  - Magnitude of increase is substantial (and clearly significant for the highest quartile)

What to do to "fix" the stroke belt?

- These data suggest that both types of interventions are needed:
  - Population-based efforts to reduce incidence of stroke
    - Interventions:
      - Primordial prevention of risk factors
      - Primary control of risk factors
    - Analyses are ongoing which risk factors are the primary target
    - Population attributable risk for hypertension, diabetes and smoking is approximately 80%
  - Hospital-based efforts to improve stroke care and stroke outcomes
    - Focus on factors improving case-fatality
    - For example, perhaps telestroke is a key
- We are looking forward to providing additional insights