# STROKE MORTALITY IS RELATED TO HOSPITAL READINESS IN A STROKE BELT STATE

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#### **BACKGROUND**

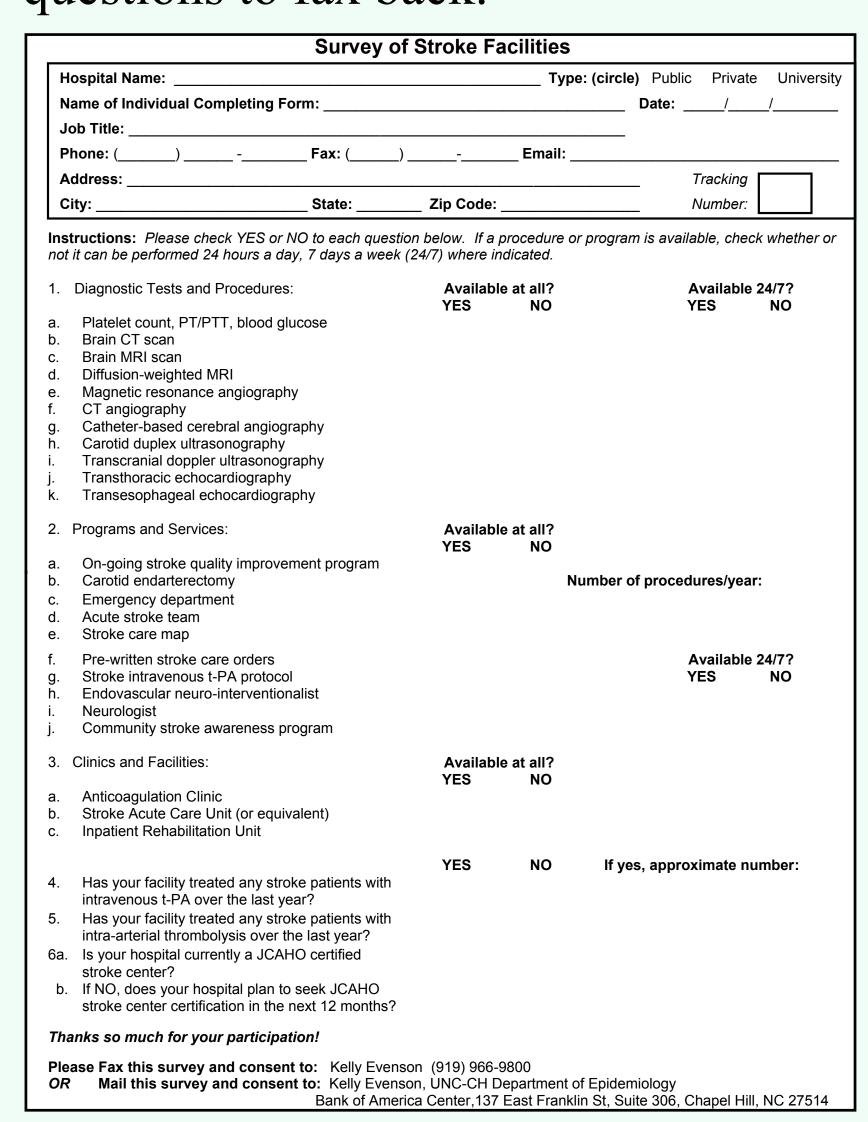
For uncertain reasons, states in the southeastern US consistently have higher rates of stroke mortality.

## **OBJECTIVE**

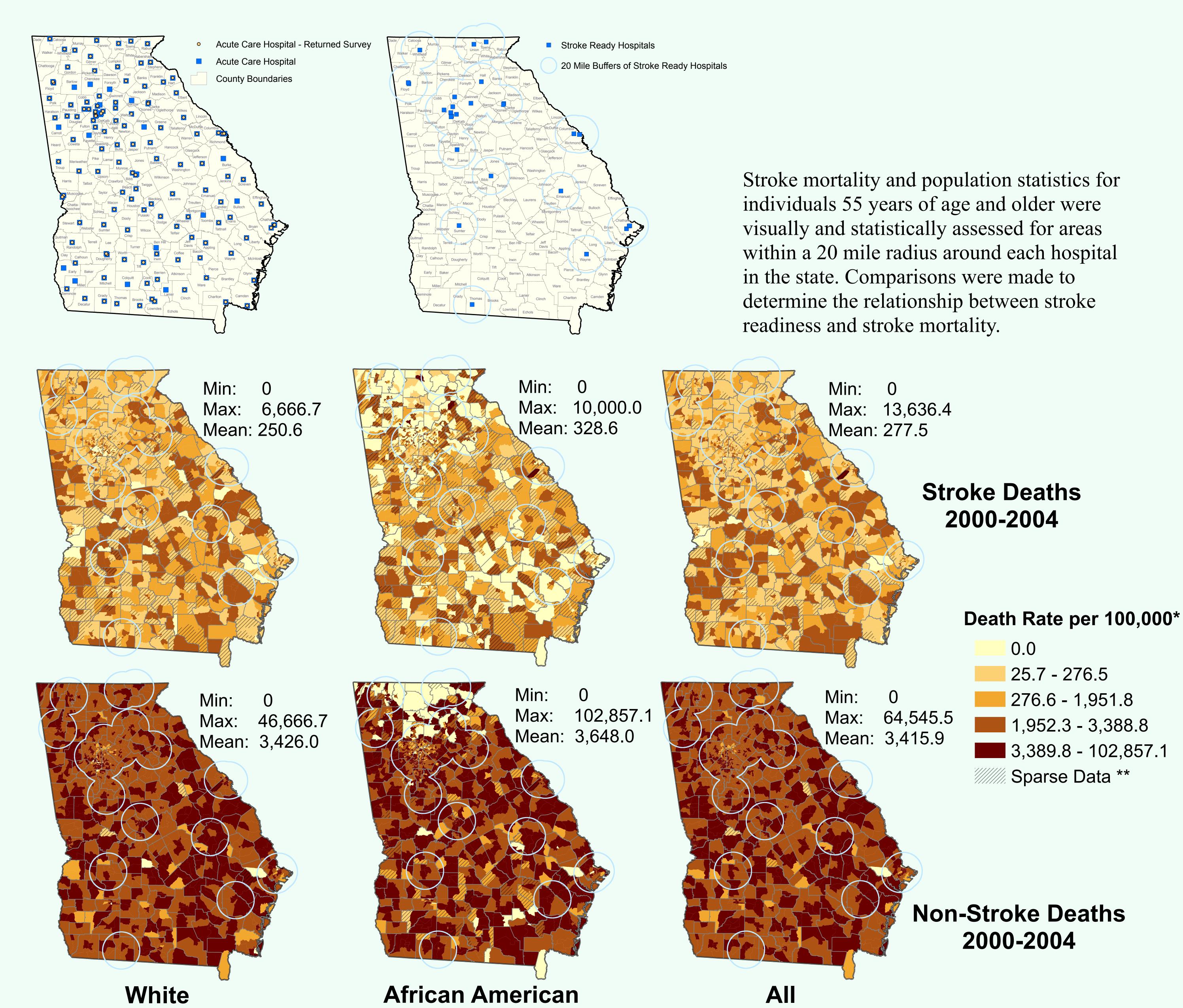
Determine the relationship between hospital resource readiness and stroke mortality statistics in the state of Georgia.

#### **METHOD**

Research was conducted as part of the Georgia Coverdell Stroke Registry and in collaboration with the Tri-State Stroke Network. A one-page survey on stroke facilities and practices was developed based on a similar survey conducted in North Carolina in 1998 (Goldstein, Hey et al. 1998; Goldstein, Hey et al. 2000). The themes addressed in the survey included diagnostic tests and procedures, programs and services, clinics and facilities, and thrombolysis. A complete listing of hospitals for the state of Georgia was obtained from the Georgia Hospital Association. The survey, along with a cover letter, was mailed to all hospital medical directors in Georgia in March 2005, with a follow-up mailing several weeks later. Non-responding medical directors were contacted at least twice by telephone. For this study, eligible hospitals included all non-government hospitals with an emergency room or that provided acute care services. Eighty-seven percent (122/141) of eligible hospitals completed and returned the survey. For any incomplete survey questions, the participants were contacted with the incomplete questions to fax back.



The definition for primary stroke care centers, and stroke readiness, came from existing recommendations (Alberts, Hademenos et al. 2000). A hospital was identified as stroke ready if it included all of the following: certain laboratory measures (i.e., platelet count, PT/PTT, blood glucose) and brain CT scan available 24 hours 7 days per week, an ongoing stroke quality improvement program, a stroke care map, stroke intravenous t-PA protocol, prewritten stroke care orders, and an emergency department with an acute stroke team.



\* Death rate by census tract is calculated as [Total number of age, race -specific deaths, for years 2000-04 / Tract age, race -specific population for year 2000 \* five] \* 100,000. With the exception of 0 values, which form their own class, the rate values have been processed into a quantiles classification scheme applicable to all six choropleth maps.

RESULTS

Overall, 69% of the state population resided within 20 miles of a stroke ready hospital. Stroke mortality risk was 20% lower for whites and African Americans aged 55 years and older living near a stroke ready hospital [RR = 0.81 (95% CI = 0.79 - 0.836); p < 0.00001]. For African Americans alone, stroke mortality was 23% lower [RR = 0.77 (95% CI = 0.73 - 0.81); p< 0.00001], and for whites alone, stroke mortality was 17% lower

\*\* Number of age, race -specific deaths <= to 4, or total white and/or black populations < 2 times the number of deaths. Sparse data, here in combination with population estimates used to calculate the rate denominator, can lead to unstable rates.

[RR = 0.83 (95% CI = 0.80 - 0.86); p < 0.00001] for people living near a stroke ready hospital. Non-stroke death was also associated with stroke readiness, but to a lesser degree: [RR = 0.91 (95% CI = 0.90 - 0.92); p < 0.00001] for whites and African Americans combined; [RR = 0.90 (95% CI = 0.90 - 0.92); p < 0.00001] for whites alone; and [RR = 0.93 (95% CI = 0.92 - 0.95); p < 0.00001] for African Americans alone.

Whites, 55 and Older										
	Inside	Outside	Total	Relative Risk	95% Confidence Interval					
Dead	8,350	5,825	14,175	0.000	0.8024	0.8579				
Alive	3,534,710	2,044,815	5,579,525							
Population at Risk	3,543,060	2,050,640	5,593,700	0.8297						
Death Rate	235.7	284.1	253.4							
Blacks, 55 and Older										
	Inside	Outside	Total	Relative Risk	95% Confi	dence Interval				
Dead	2,796	2,263	5,059	0 = 6==	0.7264	0.8114				
Alive	897,014	556,852	1,453,866							
Population at Risk	899,810	559,115	1,458,925	0.7677						
Death Rate	310.7	404.7	346.8							
Whites and Blacks Combined, 55 and Older										
	Inside	Outside	Total	Relative Risk	95% Confidence Interval					
Dead	11,146	8,088	19,234	0.000.7	0.7867	0.8330				
Alive	4,431,724	2,601,667	7,033,391							
Population at Risk	4,442,870	2,609,755	7,052,625	0.8095						
Death Rate	250.9	309.9	272.7							

# Stroke Deaths, 2000-2004

		$\mathbf{W}$	hites, 55 and (	Older		
	Inside	Outside	Total	Relative Risk	95% Confidence Interva	
Dead	112,026	71,424	183,450			
Alive	3,431,034	1,979,216	5,410,250	0.9078	0.8995	0.9162
Population at Risk	3,543,060	2,050,640	5,593,700			
Death Rate	3161.8	3483.0	3279.6			
		Bl	acks, 55 and C	Older		
	Inside	Outside	Total	Relative Risk	95% Confidence Interval	
Dead	33,138	22,111	55,249			
Alive	866,672	537,004	1,403,676	0.9313	0.9158	0.9469
Population at Risk	899,810	559,115	1,458,925			
Death Rate	3682.8	3954.6	3787.0			
	•	Whites and Bl	acks Combine	ed, 55 and Older	•	
	Inside	Outside	Total	Relative Risk	95% Confidence Interval	
Dead	145,164	93,535	238,699			
Alive	4,297,706	2,516,220	6,813,926	0.9116	0.9043	0.9190
Population at Risk	4,442,870	2,609,755	7,052,625			
Death Rate	3267.3	3584.1	3384.5			

Non-Stroke Deaths, 2000-2004

#### CONCLUSIONS

Substantially lower rates of stroke mortality are associated with areas in close proximity to hospitals that meet requirements for acute stroke readiness. Hospitals that devote resources and personnel to improve the quality of acute stroke care may have profound effects on their local community's survival and quality of life, particularly in stroke-prone populations. Efforts to support and enhance hospital preparedness should be a major public health priority.

## REFERENCES

Alberts, M., G. Hademenos, et al. (2000). "Recommendations for the establishment of primary stroke centers." <u>JAMA</u> **283**(23): 3102-3109.

Camilo, O. and L. Goldstein (2003). "Statewide assessment of hospital-based stroke prevention and treatment services in North Carolina." <u>Stroke</u> **34**: 2945-2950.

Goldstein, L., L. Hey, et al. (1998). "North Carolina stroke prevention and treatment facilities survey rtPa therapy for acute stroke." <a href="Stroke">Stroke</a> 29: 2069-2072.

Goldstein, L., L. Hey, et al. (2000). "North Carolina stroke prevention and treatment facilities survey." <u>Stroke</u> **31**: 66-70.

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