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Ethnic and Geographic Variation in Stroke Mortality Trends

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Abstract

Background and purpose—Magnitude, geographic and ethnic variation in trends in stroke within the US require updating for health services and health disparities research.

Methods—Data for stroke were analyzed from the US mortality files for 1999–2007. Age-adjusted death rates were computed for non-Hispanic African Americans (AA) and European Americans (EA) aged 45 years and over.

Results—Between 1999 and 2007 the age-adjusted death rate per 100,000 for stroke declined both in AA and in EA of both genders. Among AA females, EA females and EA males, rates declined by at least 2% annually in every division. Among AA males, rates declined little in the East and West South Central Divisions where disparities in trends by urbanization level were found.

Conclusions—Between 1999 and 2007, the rate of decline in stroke mortality varied by geographic region and ethnic group.

Keywords

African Americans; Aging; Cerebrovascular disorders; Mortality; geography

In 2009, stroke was the fourth leading cause of death in the US.^{1–4} Many publications have detailed the ethnic and geographic variation in stroke mortality in the US prior to 2000.^{3–7} This report documents ethnic and geographic variation in mortality trends from stroke within the US in the 21st century.

MATERIALS AND METHODS

Deaths in 1999–2007 with cerebrovascular disease (International Classification of Disease 10th revision [ICD-10] codes I60–I69 (1999–2007) as underlying cause were enumerated.⁵ For non-Hispanic African Americans (AA) and European Americans (EA), age-adjusted death rates per 100,000 using the 2000 US standard population were computed for persons aged 45 years and over using standard methods.⁵ Urbanization levels and Census divisions are defined in supplemental Table S1 (please see <http://stroke.ahajournals.org>).⁶

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RESULTS

In 2005–2007, average annual death rates varied by state for each group (Figure 1, Table 1, Tables S2 and S3 please see <http://stroke.ahajournals.org>). The rates for AA were highest in the South Atlantic, East and West South Central states and lowest in New England and New York; whereas rates for European Americans were highest in the South Central states, including Alabama and Mississippi, Oregon and lowest in New York, Florida and the Southwest. Ratios of the 90th to 10th percentiles of state rates were as follows: AA females 1.5, EA females 1.5, AA males 1.8, EA males 1.5. In 1979–1981 the ratios were 1.7, 1.4, 1.8, and 1.5, respectively.

In 1999–2007 rates declined in the nine US Census divisions (Table 2). Relative declines tended to be greatest in the Mountain and Pacific divisions. Variation in rate of decline was greater in AA than in EA. The slowest relative declines occurred in AA females in the W. N. Central and W. S. Central divisions, and in AA males in the E. S. Central and W. S. Central divisions.

Further, within the West South Central division for AA women, the age-adjusted rate per 100,000 was highest in small metro areas (220) and lowest in large-fringe metro areas (188). Average APC were greatest in large fringe (−4.86) and small metro areas (−4.84) and least in medium metro (−1.23) (Table S4, please see <http://stroke.ahajournals.org>). In African American men, the age-adjusted rate per 100,000 was highest in micropolitan (non-metro) areas (274) and lowest in large-fringe metro areas (213). Relative decline was greatest in non-core (non-metro) (−5.59) least in large central metro (−2.24) (Table S4).

DISCUSSION

US ethnic and geographic variation in stroke mortality or morbidity has been the subject of numerous studies.^{3,7-9-14} Yet the causes of the large geographic variation in stroke mortality have yet to be fully identified. Use of the years 1999–2007 when only ICD-10 was in use precluded bias due to changes in ICD version. High rates in Idaho, a state with a small population, should be viewed with caution. Unlike previous studies,¹⁻⁴ analyses were restricted to non-Hispanics. Lack of information did not permit further analyses to explain observed geographic patterns.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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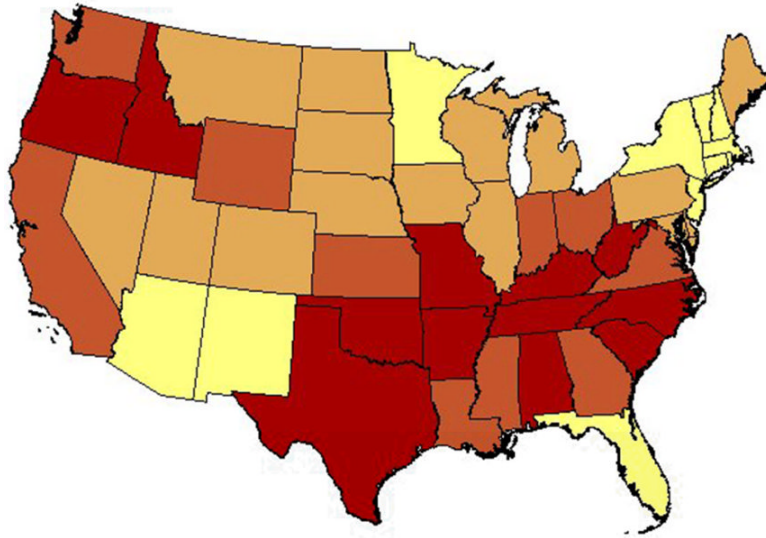


Figure 1.
Age-adjusted rate of stroke death by state for European Americans aged 45 years and over:
United States, 1999–2007. Panel A, women; panel B, men.

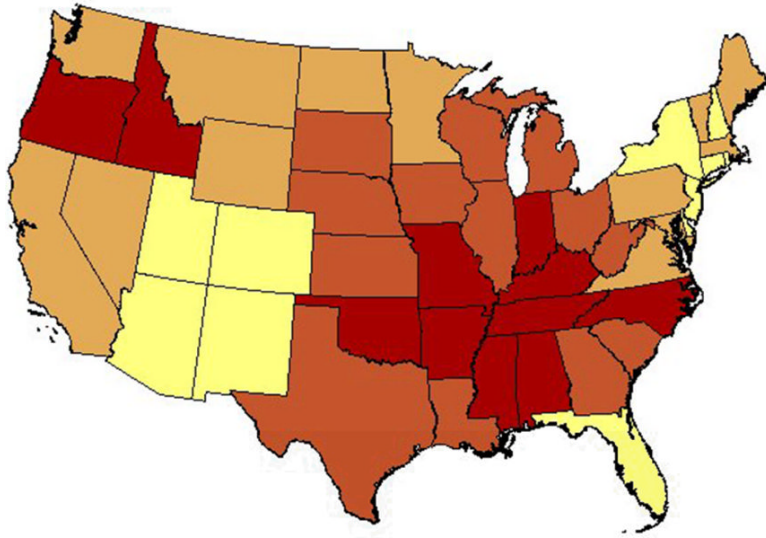


Figure 2.

Table 1

States with the highest age-adjusted stroke mortality rate per 100,000 by gender and ethnicity in non-Hispanics aged 45 years and over: United States, 2005–2007

Rank	AA women	EA women	AA men	EA men
1	Arkansas	Arkansas	Oregon	Oklahoma
2	Oklahoma	Oklahoma	Arkansas	Arkansas
3	Alabama	Tennessee	Alabama	Tennessee
4	Texas	Alabama	Tennessee	Alabama
5	Louisiana	Idaho	Kansas	North Carolina
6	Tennessee	West Virginia	Mississippi	Oregon
7	Oregon	North Carolina	South Carolina	Indiana
8	North Carolina	Kentucky	Nebraska	Kentucky
9	South Carolina	Oregon	North Carolina	Mississippi
10	California	Texas	Iowa	Alaska

AA, African American; EA, European American

Table 2

Average percent change (AAPC) and selected age-adjusted rates of stroke mortality per 100,000 and by Census division, gender and race in non-Hispanics aged 45 years and over: United States, 1999–2007

Division		AAPC	EAF	AAM	EAM
New England	AAPC	-4.2	-5.0	-4.0	-5.3
	1999	151	140	161	153
	2007	112	99	109	102
Mid Atlantic	AAPC	-4.2	-4.3	-3.5	-4.7
	1999	143	131	169	140
	2007	110	95	137	99
E. N. Central	AAPC	-3.9	-4.8	-3.7	-5.3
	1999	203	173	249	184
	2007	150	118	188	122
W. N. Central	AAPC	-2.4	-4.6	-5.1	-4.9
	1999	204	166	283	178
	2007	168	115	202	120
S. Atlantic	AAPC	-5.1	-5.4	-5.0	-5.9
	1999	236	163	287	166
	2007	158	109	195	106
E. S. Central	AAPC	-4.0	-4.6	-1.8	-5.2
	1999	229	191	254	201
	2007	171	137	242	133
W. S. Central	AAPC	-3.1	-4.5	-3.3	-4.6
	1999	236	187	260	184
	2007	186	138	210	134
Mountain	AAPC	-6.6	-5.6	-5.4	-6.6
	1999	217	160	224	160
	2007	132	106	141	94
Pacific	AAPC	-4.9	-5.9	-5.2	-6.3
	1999	256	186	279	188

Division	AAF	EAF	AAM	EAM
2007	181	115	190	116

AA, African American; EA, European American; F, females; M, males