Stroke Mortality in Blacks
Disturbing Trends

Richard F. Gillum, MD

Background—Despite long-term declines in US stroke mortality rates, declines have slowed in the past decade and targets for blacks for the years 2000 and 2010 seem attainable only by extraordinary measures, if at all. This review focuses attention on key aspects of this problem. Data from the US National Center for Health Statistics and reports of population-based studies of stroke mortality published since 1987 retrieved by computerized literature searches were reviewed.

Summary of Review—The third leading cause of death in black women and the sixth in black men in the United States in 1996, stroke accounted for 10 509 deaths in women and 7972 in men among blacks: 7.92% and 5.33%, respectively, of the total deaths. Age-adjusted death rates per 100 000 were black women, 39.2; white women, 22.9; black men, 50.9; and white men, 26.3. Available data indicate that compared with US whites, US blacks have greater mortality rates for every stroke subtype, with the likely exception of cerebral infarction due to extracranial carotid artery occlusion. These differences will persist into the 21st century. The number of stroke deaths in blacks increased by >8% between 1992 and 1996.

Conclusions—Increased research on stroke in blacks is needed to develop more effective strategies for primary and secondary prevention of stroke to reduce the high burden of premature mortality and morbidity. Renewed efforts to prevent and control stroke risk factors (in particular elevated blood pressure, diabetes, and smoking) are needed among US blacks. (Stroke. 1999;30:1711-1715.)

Key Words: blacks ■ cerebrovascular disorders ■ mortality

Stroke is the third leading cause of death in US black women and the sixth in black men.1 It is an important cause of mortality and morbidity in blacks worldwide.2 Since 1914, higher mortality from stroke in US blacks than whites has been documented by vital statistics, with differentials maintained as diagnostic technology developed over the century.3–6 In the 1960s, stroke death rates of US blacks were among the highest in the world;7,8 currently, they fall between the high rates of Eastern Europe and the low rates of North American whites.4,7,8 Stroke is an important contributor to overall higher mortality in US blacks than whites.9 This report will attempt to critically examine the current state of knowledge regarding the epidemiology of stroke mortality in blacks and to suggest directions for future population-based research on the problem.

Methods
Published and unpublished vital statistics data from the US National Center for Health Statistics for the years 1979–1997 were examined. The rubric used was 430–438 of the ninth revision of the International Classification of Diseases (ICD-9). Standard methods of analysis used are detailed elsewhere.1–16 Briefly, race-specific numbers of deaths and population estimates from the US Bureau of Census were used to compute death rates. Age standardization was performed using the direct method with the 1940 US total population as the standard.

In addition, a detailed search of the medical literature since 1987 was performed using the MEDLINE database of the National Library of Medicine and the Science Citation Index database of the Institute for Scientific Information. Population-based studies with substantial numbers of blacks were selected for review.

Recent US National Data
In blacks, numbers and rates of stroke death have failed to decline in the 1990s as they had in the 1970s and 1980s. Figure 1 shows age-adjusted cerebrovascular disease (stroke) death rates for US blacks and whites for 1979 to 1996. The third leading cause of death in black women (after heart disease and cancer) and the sixth in black men (after heart disease, cancer, HIV, unintentional injuries, and homicide) in the United States in 1996, stroke accounted for 10 509 deaths in black women and 7972 in black men; 7.92% and 5.33% of the total deaths in black women and men, respectively.1 Compared with the 18-year-low number of deaths of 17 044 in 1992, the 18 481 in 1996 represents an increase of 8.4%. Before 1992, the number of deaths had declined steadily since the high of 20 135 in 1980 (Figure 2). Age-adjusted rates per 100 000 were black women, 39.2; white women, 22.9; black

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men, 50.9; and white men, 26.3. The black/white ratio of age-adjusted rates was 1.71 in women and 1.94 in men, indicating a greater excess mortality in black men.

**Results From the Literature**

Blacks are at increased risk compared with whites for death from both hemorrhagic and ischemic stroke, with ischemic stroke predominating in both groups. Before 1970, the black-white ratio was higher in US women than men.3,10 Recent black-white ratios of age-adjusted mortality rates were similar for hemorrhagic and thromboembolic stroke, both somewhat lower than for ill-defined stroke.11–15 At ages 65 to 74, intracranial hemorrhage accounted for a similar percentage of acute stroke deaths in blacks and whites. In the MRFFIT screening cohort, the black/nonblack risk-adjusted relative risk of death from stroke for intracranial hemorrhage (RR = 2.51, 95% CI 1.71 to 3.69) and nonhemorrhagic stroke (RR = 1.57, 95% CI 1.15 to 2.16) had overlapping confidence intervals.16 Thus, ischemic stroke was the predominant cause of stroke death for both blacks and whites in the US, the reverse of reports prior to 1960.3

For at least 50 years, US blacks have had rates of stroke death 5 or 6 times higher than whites at ages 35 to 44, with ratios declining with increasing age until above age 75 rates they are lower in blacks.3–6,11–18 In 1996, age- and sex-specific race ratios (B/W), shown in Table 1, were inversely related to age and a crossover in mortality rates occurred for the age ≥85 years group, with white rates exceeding black rates.3 Because of this marked interaction of age with race, age-adjusted rates tend to obscure the large excess stroke mortality among blacks at younger ages4,14–17 (Table 1). A comparison of years of life lost (YLL) before age 75 may better reflect the excess stroke burden in blacks.1 In 1995, stroke was responsible for 601 YLL per 100 000 in black men compared with 196 in white men (ratio 3.1); in women rates were 417 and 157 (ratio 2.7), respectively. These ratios are considerably higher than those for age-adjusted mortality. Thus it is important to examine age-specific rates and YLL when making racial comparisons.

A marked slowdown in the long-term decline in stroke mortality has now been documented, but the reasons for the decline remain to be established. Long-term trends in stroke mortality before 1979 have been extensively discussed elsewhere, together with problems in the interpretation of vital statistics data.3,4,12,17–25 A decline in age-adjusted stroke death rate for black females began in 1924, about the same time as for white females; however the decline was much slower than in whites.3 A decline did not begin for black males until 1930, and it was also much slower than in whites. In North Carolina, as in the whole United States, the absolute disparity by sex and race decreased between 1962 and 1987, while the ratio of black to white mortality rates remained relatively constant.21 Declines accelerated for all groups in the 1970s.10

Since the early 1980s a marked slowdown has occurred in the decline in US stroke mortality in black and white Americans (Figure 1).4,20–25 The serious impact of this slowdown in the decline of stroke mortality in the United States since 1978 is even greater than previously thought.20 The rate of decline in 1987–1994 had returned to that seen in the 1960s, before the widespread availability of antihypertensive therapy; this occurred in each sex-race group.23 This has caused the number of stroke deaths in blacks to rise since 1992, reversing a steady long-term decline (Figure 2). A similar trend was seen in whites. Published data on trends in incidence and case fatality of stroke in blacks are few. One analysis of Medicare data from 1985 to 1991 revealed no significant trend in stroke incidence for blacks; no analysis of case fatality trends for blacks was reported.24 The slowdown in the decline in stroke mortality may be related to a similar, though less dramatic, slowdown in the decline in ischemic heart disease mortality, especially apparent among blacks.25

The rising prevalence of chronic ischemic heart disease and heart failure, diabetes, and obesity, which increase the pool of persons at high risk for stroke, and the failure of hypertension control rates to improve after 1988–1991 seem to be good candidates to explain, at least in part, the slowdown in the decline of stroke mortality in blacks and whites.22,23,26

Blacks in the southeast region of the United States continue to suffer the highest stroke mortality rates, especially in nonmetropolitan areas. In the United States in 1988–1992, as in earlier studies, considerable geographic variation in age-adjusted stroke mortality was demonstrated.
for each sex-race group. In black women and men, previously described high mortality in the southeastern US persisted. Stroke death rates were relatively high in the Carolinas, Georgia, and along the southern Mississippi River for both black and white females. Surprisingly, rates were high in southern California for black females and along the entire Pacific coast for white females. Rates were highest among black males for the South Atlantic–South region. For all race-sex groups, there was significant regional variation in the rate of decline during the period 1979 through 1989; the South initially had the highest rates but also had the most rapid decline for all race-sex groups, which resulted in the emergence of high-rate areas in the Mississippi Valley.

However, the stroke mortality rates among black and white residents of the coastal plain of North Carolina, South Carolina, and Georgia (the “Stroke Belt”) continued to show a 40% excess risk of stroke mortality compared with the rest of the United States in recent analyses. In 1996, the age-adjusted rate was highest in East South Central region, followed closely by West South Central and South Atlantic regions. Within regions, blacks in nonmetropolitan areas had higher stroke death rates than those in metropolitan areas. Studies to explain these geographic patterns and public health programs for high mortality areas are now needed.

Stroke death rates in US blacks in 1990 were similar to rates in Japan, lower than those in Eastern Europe, but higher than those in US whites (Figure 3). In the 1960s, stroke death rates in US blacks and in Japanese were among the highest in the world; impressive declines in the United States and Japan occurred to produce the present pattern. Although reliable stroke mortality rates are largely lacking for black populations outside the United States, available data indicate relatively high rates for blacks in urban Africa, the Caribbean, and Latin America. However, rates from developing countries must be interpreted with caution because of possible inaccuracies in death certification and population enumeration. Studies of immigrants from developing to developed countries have been informative.

For example, in England and Wales, Caribbean blacks had the highest rates, followed by Africans and Indians, all of which were higher than rates for whites in England and Wales. Although anecdotal reports suggest low rates of death from stroke in traditional African societies, blacks who have adopted Western lifestyles suffer high rates of stroke mortality. Cohort or surveillance studies are needed to document international variations in stroke mortality among black populations.

**US goals for 2000 and 2010.** Given the growing burden of disease, national research and stroke control efforts are vital. Through an extensive consultative process in the late 1980s, the US Department of Health and Human Services set a target goal for age-adjusted stroke mortality in blacks for the year 2000 of 27 deaths per 100 000 (a nearly 50% decline from a 1987 baseline of 51.2). The 1996 rate for blacks was 44.2, well short of the goal for 2000. By a similar process, goals are being set for the year 2010 (Table 2). Eliminating (not merely reducing) health disparities among population groups together with increasing the years and quality of life are the 2 overarching goals. Suggested but not finalized targets for stroke mortality are 16 per 100 000 for all Americans, white and black. Clearly, achieving the goals of eliminating racial disparities and achieving desirable targets will require major new efforts. Given that rate for black men was 51 and that for black women 40 in 1996 it seems likely that such a target for blacks could only be achieved by some currently unforeseen breakthrough in prevention or treatment.

**Recommendations for future population-based research.** Table 3 lists future research needs that are considered to have high priority based on information reviewed. Although not

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**TABLE 1. Death Rates for Cerebrovascular Disease by Age, Sex, and Race: United States, 1996**

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Rate per 100 000</th>
<th>Race Ratio</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>45–54</td>
<td>62.1</td>
<td>15.2</td>
<td>38.6</td>
</tr>
<tr>
<td>55–64</td>
<td>137.5</td>
<td>43.4</td>
<td>82.9</td>
</tr>
<tr>
<td>65–74</td>
<td>292.2</td>
<td>142.0</td>
<td>216.4</td>
</tr>
<tr>
<td>75–84</td>
<td>653.0</td>
<td>500.1</td>
<td>586.5</td>
</tr>
<tr>
<td>≥85</td>
<td>1329.5</td>
<td>1537.7</td>
<td>1443.6</td>
</tr>
</tbody>
</table>

Data are from *Health, United States, 1998* (pp 228–230).
Stroke is the third leading cause of death in US black women and the sixth in black men and an important cause of mortality and morbidity in blacks worldwide. Mortality rates remain higher in blacks than whites in the United States, and the rate of YLL before age 75 due to stroke was triple that in whites in 1995. This situation will persist well into the 21st century. Strategies for primary and secondary prevention of stroke appropriate for particular segments of the black population must be developed and vigorously implemented to reduce the burden of premature mortality and morbidity.36–45 Renewed efforts to prevent and control stroke risk factors, particularly elevated blood pressure, diabetes, and smoking, are urgently needed in the black community.

References


TABLE 2. Proposed* US Goals for Health Promotion and Disease Prevention for the Year 2010: Stroke Deaths

1. Reduce stroke deaths to no more than 51 per 100 000 population for each population group. (Baseline: age-adjusted rate per 100 000 of 63 total, 61 white, 85 black in 1996)†
2. Increase the proportion of the US adult public, aged ≥20 years, that is aware of the early warning symptoms and signs of stroke (brain attack).
3. Increase the proportion of healthcare providers who counsel their high-risk patients (those with previously diagnosed cerebrovascular disease) and family members/significant others about the early warning symptoms and signs of a stroke (brain attack), including the importance of seeking rapid emergency evaluation.
4. Using various study designs, examine the hypothesis that regional differences in stroke subtype distribution, incidence, case fatality, recurrence, competing mortality, utilization of therapeutic stroke care, population prevalence of stroke and heart disease, hypertension control, and diabetes prevalence.
5. Using existing data and computer modeling, estimate the potential range of impact on stroke mortality in blacks of early thrombolytic therapy of ischemic stroke, and the relative cost effectiveness compared with other interventions (eg, hypertension control).
6. Using various study designs (see No. 1 above), test the hypotheses that the geographic variation in stroke mortality is due to differences in stroke subtype distribution, incidence, case fatality, recurrence, utilization of therapeutic stroke care, population prevalence of stroke and heart disease, hypertension control, and diabetes prevalence.
7. Using various study designs, examine the hypothesis that regional migration history is an important determinant of risk of stroke death and incidence.
8. Perform validation studies to assess stroke and stroke subtype diagnostic accuracy on death certificates by race, age, sex, and region.
9. Perform experimental or quasi-experimental studies to establish the feasibility of substantially improving awareness of stroke warning symptoms and signs among adults and decreasing delay in care seeking among persons suffering acute stroke in communities.
10. Perform studies to assess the impact of implementation in 1999 of the International Classification of Diseases, Tenth Revision, on stroke mortality patterns and trends by race, age, sex, and region.
11. Perform cohort or surveillance studies to document international variation in stroke mortality in black populations.
12. Perform community trials in black populations to test methods for reducing multiple stroke risk factors.

TABLE 3. Recommendation for Population-Based Research on Stroke Mortality in Blacks

1. Using various study designs (community surveillance, Medicare/administrative cohorts, population-based cohort, HMO populations, and others) test the hypotheses that the slowdown in the decline in stroke mortality is due to changes in stroke subtype distribution, incidence, case fatality, recurrence, competing mortality, utilization of therapeutic stroke care, population prevalence of stroke and heart disease, hypertension control, and diabetes prevalence.
2. Using existing data and computer modeling, estimate the potential range of impact on stroke mortality in blacks of early thrombolytic therapy of ischemic stroke, and the relative cost effectiveness compared with other interventions (eg, hypertension control).
3. Using various study designs (see No. 1 above), test the hypotheses that the geographic variation in stroke mortality is due to differences in stroke subtype distribution, incidence, case fatality, recurrence, utilization of therapeutic stroke care, population prevalence of stroke and heart disease, hypertension control, and diabetes prevalence.
4. Using various study designs, examine the hypothesis that regional migration history is an important determinant of risk of stroke death and incidence.
5. Perform validation studies to assess stroke and stroke subtype diagnostic accuracy on death certificates by race, age, sex, and region.
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