Incidence Rates of Stroke in the Eighties: The End of the Decline in Stroke?

Lewis H. Kuller, MD, DrPH

Has the decline in the incidence of stroke ended? If so, why? These questions are addressed in the May issue of Stroke in the study of Broderick et al.\(^1\) based on the trends in stroke incidence in Rochester, Minnesota, between 1950-1954 and 1980-1984. The incidence of stroke for men in that community declined until 1975-1979 and then increased in 1980-1984, while for women the incidence rates appeared to "bottom out" around 1970-1974 and increased in 1980-1984. The apparent increase between 1975 and 1979 occurred in every 10-year age group from 45 to older than 85 years. However, by 1980-1984, approximately half of the incident strokes occurred among individuals 75 years of age or older.

The mortality and case-fatality rates following a stroke continued to decline, which is consistent with trends in stroke mortality in the United States and many other countries.\(^2\)

The first question to be resolved is whether the trends to 1980-1984 are an artifact of case-ascertainment, criteria of diagnosis, changes in the characteristics of the population at risk, or, possibly, errors in the measurement of the size of the population at risk.

The cases were all collected in the same way, reviewed by the same nurse-abstractor, and had criteria of diagnoses that were consistent over time. It is extremely unlikely that between 1975-1979 and 1980-1984 there was a substantial change in the ascertainment of stroke cases within this community. It is possible that strokes diagnosed in the 1950-1954 period were missed, but if this were the case, the trends to 1975-1979 would not have shown the decline in the incidence rates.

The selected increase in the use of CT scans in the 1970s and 1980s could have resulted in a greater ascertainment of strokes, but the authors wisely excluded strokes diagnosed only on the basis of CT scan or autopsy findings, without prior clinical evidence of stroke. They believe, however, that the use of CT scans may have increased physicians' awareness of clinical symptomatology and the subsequent diagnosis of stroke. The apparent flattening of the decline in the rates for women beginning in the early 1970s and especially across most age groups is probably not due primarily to the introduction of the CT scans. It would have been useful to compare the trends of stroke by degree of disability at the time of diagnosis. An increase limited only to the very mild strokes with minimal neurological dysfunction or residual effect would be stronger evidence for the impact of CT scans on the incidence rates. The authors do note that the apparent increase in stroke was greater for intracerebral hemorrhage clearly due to improved diagnosis based on the CT scans. However, cerebral infarction rates, as well as total strokes, also were no longer declining from the 1975-1979 and 1980-1984 time periods. Thus, misclassification of the type of stroke is unlikely to account for the overall trends in total stroke incidence. It would be extremely valuable to have data on the frequency of lesions on CT scans that would be consistent with stroke diagnosis in the so-called normal population. It is probable that there is a high prevalence of silent lesions identified on CT scans. The trends in stroke noted in Rochester, therefore, may be due to a transfer of the asymptomatic to the symptomatic stroke category, even though great efforts were made to reduce this potential bias.

The authors provide little information about the accuracy of the population estimates in Rochester or the changing characteristics of the population over time. It is unlikely, however, that a substantial error in the number of people living there between 1975-1979 and 1980-1984 or major changes in the composition of the population, such as the inclusion of more high-risk individuals in the community, would have a substantial effect on the trends.

Their method of analyzing age-specific and age-adjusted rates may have caused a serious artifact in their results. Stroke rates increase with age, at least doubling with each decade from 45 to 85 years. If the age distribution within each 10-year age span is shifting upward, then the mean age of the population within each 10-year age group may be increasing over time. Similarly, the age-adjusted rates would appear to be higher. Ten-year age-specific
categories are too wide for an analysis of a disease like stroke that increases so rapidly with age. A Poisson regression analysis is included in their analysis, but it is unclear whether a single year of age or 10-year age bands were used in this specific analysis. The small number of cases obviously limits their ability to separate stroke by finer age categories over time. The mean age and distribution of ages within each 10-year band should be checked and the rates adjusted for any upward drift in the age distribution within each of these age bands.

If the stroke incidence rates are really increasing in Rochester, Minnesota, the reasons need to be considered. There are at least three major factors to consider. First, hypertension is the primary risk factor for stroke. An increase in the prevalence of hypertension or in the efficacy of treatment could result in an increase in stroke incidence. A change in the prevalence of age-specific hypertension over the 1975-1979 to 1980-1984 time period is unlikely in Rochester. The treatment of hypertension in this community in 1986 was described in a recent report. Thirty-one percent of the population was defined as hypertensive, with a history of hypertension, or with a systolic blood pressure greater than 160 mm Hg or a diastolic greater than 95 mm Hg. If hypertension is considered to be controlled at a blood pressure of 140 mm Hg systolic/90 mm Hg diastolic or less, it was controlled in only about one half (53%) of the hypertensive residents. Diuretic therapy was the primary treatment for 50% and was used in combination with a β-blocker in 17% of those who were on drug therapy.

Clinical trials suggest that the risk of stroke declines linearly with decrease in blood pressure, secondary to drug therapy. Between 1975-1979 and 1980-1984, there was a substantial increase in the number of drugs available for the treatment of hypertension, as well as a change in the dosage of diuretics used in the treatment of hypertension. It would be interesting to determine whether the levels of blood pressure of treated hypertensive residents in 1980-1984 were different from those in 1975-1979, particularly related to changes in the type and amount of drug therapy provided.

No data are available on the changing percentage of stroke cases that occur among individuals with controlled as compared with uncontrolled hypertension. If aggressive blood pressure reduction by drug therapy was modified in the 1980-1984 period, the increase in stroke may be related to this factor. This possibility, although remote, would have important implications with regard to the treatment of hypertension and stroke incidence rates in the United States.

The second factor to consider in rising incidence rates is the decline in coronary heart disease incidence and mortality, which may have produced a substantial increase in the pool of individuals at high risk for stroke. Stroke and coronary artery disease share common risk factors, and both are related to atherosclerosis and thrombosis. For example, improved survival of patients after a myocardial infarction or angina pectoris may result in the expansion of a high-risk pool of patients at risk for stroke. It will be interesting to evaluate the stroke trends after excluding individuals with prior clinical coronary heart disease. Similarly, the pool of diabetics, another group at high risk for stroke, may be increasing because of better treatment of other diabetic complications. The combination of diabetics and hypertension may be an especially important risk factor for stroke.

A third possibility is that there is an increase in stroke secondary to the greater use of newer surgical and diagnostic procedures, especially vascular procedures. Stroke cases that occur secondary to cardiac diagnostic or surgical procedures, especially bypass surgery, should be evaluated in this study.

The Rochester Stroke Study provides important information, but perhaps has generated more questions than answers. It is unfortunate that similar data bases that could replicate these important results are not in place in the United States. Counting cases in a community may seem rather pedantic; however, the determination of both temporal trends and geographic variations is often the starting point for important etiological research as well as the rationale for the development of clinical trials and the evaluation of the efficacies of therapies.

Stroke mortality rates continue to decline, and it is hoped that the incidence rates and disability following a stroke will also decrease. It is important to evaluate further the information from the Rochester Study in the hope that the increase in 1980-1984 is attributable to the greater availability of CT scans, an artifact due to improved surveillance. It would also be extremely worthwhile to have data on the frequency of abnormalities on the CT scan consistent with a stroke diagnosis among normal populations (especially those in the same age group as potential stroke patients) and to relate these observations to the classic risk factors for stroke. Such information would be important in determining the frequency of asymptomatic stroke and its relation to other diseases, such as multi-infarction dementia. As the authors note, a shift from the "asymptomatic" to the "symptomatic" category could have a major impact on stroke rates.

References


**KEY WORDS** • cerebrovascular disorders • incidence
Incidence rates of stroke in the eighties: the end of the decline in stroke?
L H Kuller

Stroke. 1989;20:841-843
doi: 10.1161/01.STR.20.7.841

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://stroke.ahajournals.org/content/20/7/841.citation

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org/subscriptions/