

# Atlas of Stroke Hospitalizations

## Among Medicare Beneficiaries

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# A Message from the Director, National Center for Chronic Disease Prevention and Health Promotion

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The Centers for Disease Control and Prevention (CDC) is committed to reducing the burden of stroke—the third leading cause of death and a leading cause of serious, long-term disability in the United States. Strokes are largely preventable, and with targeted public health efforts, we can alleviate much of the heavy burden of this disease.

The *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries*, produced in collaboration with the Centers for Medicare & Medicaid Services, provides for the first time county-level maps of stroke hospitalizations for blacks, Hispanics, and whites ages 65 and older. Geographic Information Systems provide increasingly important analytic techniques to examine public health outcomes and were utilized here to document the large geographic disparities that exist in stroke hospitalizations across the United States, as well as the differences observed among racial/ethnic groups. This information is critical for health professionals working at the local, state, and national levels to eliminate geographic and racial disparities in stroke hospitalizations.

This publication is the fifth in a series of CDC atlases related to heart disease and stroke. The series includes

*Women and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality*

*Men and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality*

*Atlas of Stroke Mortality: Racial, Ethnic, and Geographic Disparities*

*Atlas of Heart Disease and Stroke Among American Indians and Alaska Natives*

Together, these publications have informed policy makers and researchers across the country about the serious geographic disparities in heart disease and stroke.

Now, I am pleased to share with you the *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries*. I encourage you to use these data, in conjunction with other data sources, to improve the prevention and treatment of stroke among older adults in the United States.



Janet L. Collins, PhD

Director, National Center for Chronic Disease Prevention and Health Promotion

Centers for Disease Control and Prevention

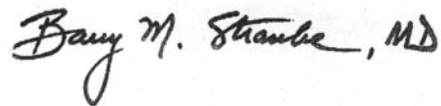
## A Message from the Chief Medical Officer, Centers for Medicare & Medicaid Services

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The burden of stroke is very large among Medicare beneficiaries. Eighty-eight percent of all fatal strokes in the United States occur among older Americans (ages 65 and older), making stroke the third leading cause of death as well as a leading cause of serious, long-term disability among older Americans. The Centers for Medicare & Medicaid Services (CMS) recognizes the important impact of this disease on its beneficiaries and is committed to assuring the delivery of high-quality care for Medicare beneficiaries that suffer a stroke.

The county-level maps presented in this *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries* support two of the CMS objectives regarding access to quality care: (1) Improve quality of care and health outcomes of the beneficiaries of CMS programs, and (2) Improve access to services for underserved and vulnerable beneficiary populations, including reducing health disparities. For instance, the maps included in this *Atlas* provide health care agencies at local, state, and national levels with the ability to identify geographic disparities in ischemic stroke, hemorrhagic stroke, and ill-defined stroke. Maps depicting the geographic patterns of stroke patients being discharged home, to skilled nursing facilities, and to other care facilities shed light on the local needs of Medicare beneficiaries after they leave the hospital. The addition of racial/ethnic-specific maps for each section of the *Atlas* enables the reader to identify racial/ethnic differences in the geographic disparities and tailor prevention or treatment programs to the needs of each racial/ethnic group.

We envision a broad array of applications for the material included in this *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries*. We hope that health professionals in a variety of institutions and from many perspectives will integrate the data presented in this *Atlas* with other data sources to improve the access to quality care for Medicare beneficiaries before a stroke occurs as well as during and after the tragic occurrence of a stroke.



Barry M. Straube, MD  
Director and Chief Medical Officer, Office of Clinical Standards and Quality  
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I am pleased to present the *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries*. The maps in this *Atlas* highlight the geographic disparities in stroke hospitalizations by stroke subtype, race/ethnicity, discharge status, and comorbidity within the Medicare population in the United States, Puerto Rico, and the U.S. Virgin Islands. Maps of stroke-related costs, hospital facilities, and stroke specialists are also included.

This landmark document supports the elimination of health disparities, one of the two overarching goals of *Healthy People 2010*, and addresses the important need to reduce the risk of stroke among all Americans, including older Americans. The maps in the *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries* present county-by-county estimates of the burden of stroke in the United States, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. With the information in these maps, public health professionals and concerned citizens at local, state, and national levels will be better equipped to tailor stroke prevention and treatment resources to Americans ages 65 years and older.

The maps in this *Atlas* supplement CDC's Paul Coverdell National Acute Stroke Registry that was established in 2004 to measure and improve the quality of care for stroke patients. Seven states have been funded (Georgia, Illinois, Massachusetts, Michigan, Minnesota, North Carolina, and Ohio) to implement the registry. Together, the information from the state stroke registries and the data in this *Atlas* provide important opportunities for promoting stroke-free communities and for improving the quality of care for stroke patients.

The fact that stroke is the third leading cause of death and a leading cause of serious, long-term disability for all Americans and for Americans ages 65 years and older underscores the need for additional attention and improved stroke preventive services for older Americans, including innovative, community-based strategies for reducing the risk of stroke. We can expect to achieve the greatest public health impact on the burden of stroke through prevention at the individual and community levels, along with early evaluation and treatment of persons with acute stroke. The *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries* provides critical information to be used in tandem with other data sources to tailor stroke prevention programs and policies to the needs of local populations of older Americans.

We hope that you will find this publication to be a valuable resource as you design programs and policies to eliminate geographic and racial disparities in stroke hospitalizations among Medicare beneficiaries.



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The Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention (CDC), is pleased to present this *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries*. The maps presented in this document highlight the geographic disparities in stroke hospitalizations in the United States, Puerto Rico, and the U.S. Virgin Islands during 1995–2002. Counties with the highest stroke hospitalization rates are concentrated primarily in the southeastern states. This geographic pattern is similar to the one we observed for counties with the highest stroke death rates during 1991–1998 in an earlier atlas titled *Atlas of Stroke Mortality: Racial, Ethnic, and Geographic Disparities in the United States* (2003). The maps in these two atlases suggest that the southeast region has an elevated risk for both fatal and nonfatal strokes.

In order to more fully examine the geographic disparities in stroke hospitalizations among Medicare beneficiaries, this *Atlas* includes maps of (1) the rate of stroke hospitalizations by stroke subtype, (2) the percentage of stroke hospitalizations by discharge status, (3) the percentage of stroke hospitalizations with selected comorbidities, (4) the distribution of hospitals and stroke specialists, and (5) county averages of hospital charges for stroke hospitalizations.

The major findings from this *Atlas* are summarized in this Executive Summary for the total U.S. population of Medicare beneficiaries ages 65 and older, all racial/ethnic groups combined. However, there are substantial variations in the patterns of stroke hospitalizations for different racial/ethnic groups. Within each section of this *Atlas*, we present race/ethnic-specific maps for blacks, Hispanics, and whites. These maps illustrate that it is critical for those working to prevent and treat stroke among racial and ethnic minority groups to consider the unique geographic patterns for each racial/ethnic group. To facilitate the comparison of stroke hospitalizations by race/ethnicity, we have included a section titled “Maps At-a-Glance” in which race-specific maps are presented side-by-side for stroke hospitalization subtypes, discharge destinations, and comorbidities (see Section 7, page 138).

Highlights from each section within the *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries* are summarized below.

## Demographics of national stroke hospitalization rates per 1,000 Medicare beneficiaries, 1995–2002

- *Gender*: The stroke hospitalization rate was higher for men (19.4) than for women (15.7) (**Table 1.3**).
- *Race/Ethnicity*: The stroke hospitalization rate was highest among blacks (21.8), followed by whites (16.8) and Hispanics (16.0). The stroke hospitalization rate for blacks was 26.7% higher than the rate for the total population (17.2) (**Figure 1.6** and **Table 1.3**).
- *Age Group*: Stroke hospitalization rates increased sharply with increasing age (**Figure 1.5** and **Table 1.3**). The rate for the oldest age group (85 years and older) was 30.1—almost 3 times higher than the rate for the youngest age group (65–74 years), which was 11.2.

## Stroke hospitalization rates by stroke subtype among Medicare beneficiaries, 1995–2002

- Ischemic strokes accounted for the largest percentage (67%) of stroke hospitalizations, followed by ill-defined (20.3%) and hemorrhagic (11.6%) strokes (**Table 1.2**).
- *Geographic Patterns*: The maps of stroke hospitalization rates for each stroke subtype (ischemic, hemorrhagic, and ill-defined) show that counties with the highest rates were located primarily in the southeastern states. For ischemic stroke, high-rate counties also were concentrated in parts of Appalachia; for hemorrhagic stroke, concentrations of high-rate counties also were seen in Texas, California, and Oregon; and for ill-defined stroke, southern Appalachia and much of Oklahoma also had high-rate counties.



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## Stroke hospitalizations by discharge status among Medicare beneficiaries, 1995–2002

- Of those hospitalized for stroke, 51% were discharged home, 21.1% to a skilled nursing facility, and 17.6% to other care facilities; 13.9% died within 30 days and 8.8% died before being discharged (**Figure 1.11** and **Table 1.4**).
- *Geographic Patterns:* The maps of stroke hospitalizations by discharge status show very different geographic patterns for each discharge destination. Counties with the highest percentages of stroke patients discharged home were concentrated primarily in Michigan, West Virginia, and Alabama; counties with the highest percentages discharged to skilled nursing facilities were found mostly within the midwestern and western states; and counties with the highest percentage of stroke patients that died prior to being discharged were located primarily in the Northeast, the Southeast, and parts of the Southwest.

## Stroke hospitalizations with comorbidities among Medicare beneficiaries, 1995–2002

- About 61% of stroke hospitalizations included a diagnosis of hypertension, 24.7% included a diagnosis of diabetes, and 18.7% included a diagnosis of atrial fibrillation. More than 75% of stroke hospitalizations had a concurrent diagnosis of hypertension, diabetes, or atrial fibrillation; more than 25% of stroke hospitalizations included a diagnosis of two of these conditions (**Figure 4.1** and **Figure 4.2**).
- *Geographic Patterns:* The maps of stroke hospitalizations with comorbidities show that the geographic patterns were similar for hypertension and diabetes but quite different for atrial fibrillation. Counties with the highest percentages of stroke hospitalizations that included a diagnosis of either hypertension or diabetes were concentrated largely in the southeastern coastal states of North Carolina, South Carolina, and Georgia. For stroke hospitalizations with hypertension, there also was a concentration of high-percentage counties in Florida. For stroke hospitalizations with diabetes, south Texas, Puerto Rico, and parts of Appalachia also had concentrations of high-percentage counties. On the other hand, for stroke hospitalizations that included a diagnosis of atrial fibrillation, the high-percentage counties were concentrated largely in the northern regions of the United States, from the Northeast to the Pacific Northwest, along with southern Florida.

## Hospitals and stroke specialists

- There were 4,835 short-term general hospitals in the United States in 2002. About 22% of all counties had no short-term general hospital at all, 77% of counties were lacking short-term general hospitals with neurology services, 78% of counties were lacking short-term general hospitals with rehabilitation care services, and 31% of counties were lacking short-term general hospitals with an emergency department. There were 12,532 nonfederal neurologists and 4,934 nonfederal neurosurgeons in the United States in 2002. The majority of counties in the United States did not have a neurologist (71%) or a neurosurgeon (81%).
- *Geographic Patterns:* The maps show that counties with the largest number of short-term general hospitals with stroke-related services (i.e., emergency room, neurological services, and rehabilitative services) and the largest number of stroke specialists (i.e., neurologists and neurosurgeons) were located primarily in urban areas.

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## Hospital charges for stroke hospitalizations

- From 1995 to 2000, the total amount charged to Medicare for stroke hospitalizations rose from \$6.34 billion to \$7.04 billion. The average hospital charge to Medicare per stroke hospitalization per county also rose, from \$12,477 in 1995 to \$15,818 in 2000.
- *Geographic Patterns:* The maps show that the geographic pattern of counties with the highest average charges per stroke hospitalization did not change dramatically from 1995 to 2000. Counties with the highest average charges per stroke hospitalization were scattered throughout much of the United States, with concentrations of high-charge counties in California, Arizona, Florida, and the Boston-New York City corridor.

## Conclusion

The *Atlas of Stroke Hospitalizations Among Medicare Beneficiaries* reflects the commitment of the Division for Heart Disease and Stroke Prevention at CDC to examine patterns of geographic disparities in heart disease and stroke-related morbidity and mortality. We envision these maps being used at the local, state, regional, and federal levels to promote health system policies and environmental or community changes that will reduce the geographic disparities illustrated in these pages. As noted in our earlier atlases, we contend that health disparities at the local level reflect underlying inequities in local social environments that result in some communities having fewer health-promoting resources than others. The local social environment provides the context within which individuals are exposed to structural risk factors (e.g., lack of economic opportunity, poverty, social isolation) that can influence the adoption of unhealthy behaviors (e.g., cigarette smoking, poor eating habits, physical inactivity) and that may hinder access to appropriate diagnosis and treatment for both stroke and its major underlying risk factor, uncontrolled hypertension.

We hope the data presented in this *Atlas* will help local, state, and federal public health agencies, their partners, and advocacy groups improve stroke hospitalization outcomes among Medicare beneficiaries in communities across the country.