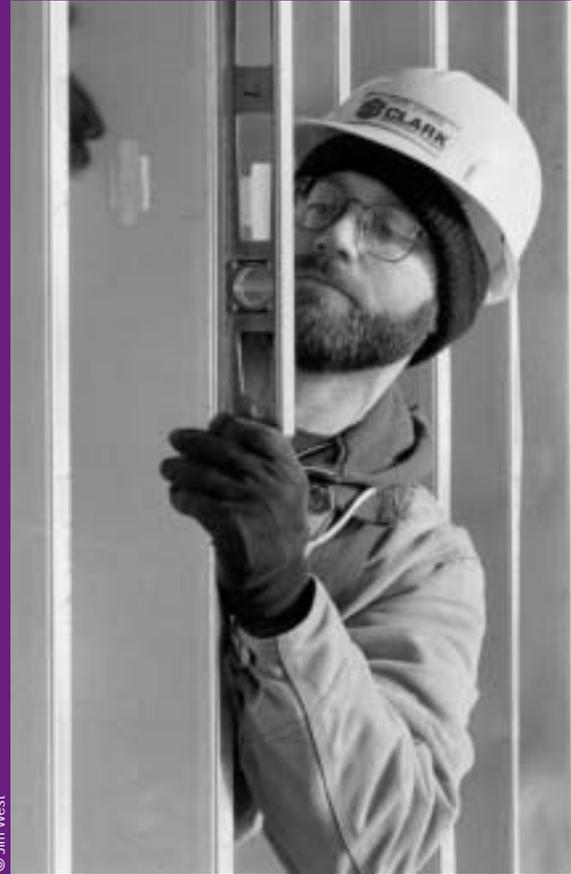


A carpenter helps construct a minor league baseball stadium in Lansing, Michigan.

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B Methodological and Technical Notes

County Definitions

Data from several different sources were used in this publication. To ensure comparability of county definitions, we used Federal Information Processing Standard (FIPS)¹ codes to link county definitions across data sets and to reconcile differences. For most states, county definitions were 100% comparable across the data sets. Definitions that were not comparable were modified as needed; details regarding these modifications are explained in the following sections.

Independent Cities

The following independent cities were retained in the geographic database as discrete entities separate from adjacent counties. FIPS codes were modified as needed to allow data from multiple data sources to be accurately linked.

Independent City	State	Original FIPS Code	Modified FIPS Code
Baltimore	Maryland	24510	24007
St. Louis	Missouri	29510	29191
Carson City	Nevada	32510	32025
Suffolk	Virginia	51800	51123

Alaska

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Aleutian Islands East	2013	Aleutian Islands	2010
Aleutian Islands West	2016	Aleutian Islands	2010
Denali Borough	2068	Yukon-Koyukuk	2290
Kobuk	2140	Yukon-Koyukuk	2290
Skagway-Hoonah-Angoon	2232	Skagway-Yakutat-Angoon	2231
Yakutat	2282	Skagway-Yakutat-Angoon	2231

Arizona

Independent City	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Yuma	4027	LaPaz	4012

Hawaii

Independent City	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Kalawao	15005	Maui	15009

Virginia

Virginia has 34 independent cities. We used the 1996 Area Resource File database to incorporate data from these cities into their adjacent counties, which is standard practice.

Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Bedford	51515	Bedford	51019
Bristol	51520	Washington	51191
Buena Vista	51530	Rockbridge	51163
Charlottesville	51540	Albemarle	51003
Clifton Forge	51560	Allegheny	51005
Colonial Heights	51570	Chesterfield	51041
Covington	51580	Allegheny	51005
Danville	51590	Pittsylvania	51143
Emporia	51595	Greensville	51081
Fairfax	51600	Fairfax	51059
Falls Church	51610	Fairfax	51059
Franklin	51620	South Hampton	51175
Fredericksburg	51630	Spotsylvania	51177

Continued on next page

Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Galax	51640	Grayson	51077
Harrisonburg	51660	Rockingham	51165
Hopewell	51670	Prince George	51149
Lexington	51678	Rockbridge	51163
Lynchburg	51680	Campbell	51031
Manassas	51683	Prince William	51153
Manassas Park	51685	Prince William	51153
Martinsville	51690	Henry	51089
Norfolk	51710	Norfolk	51129
Norton	51720	Wise	51195
Petersburg	51730	Dinwiddie	51053
Portsmouth	51740	Norfolk	51129
Radford	51750	Montgomery	51121
Richmond	51760	Henrico	51087
Roanoke	51770	Roanoke	51161
Salem	51775	Roanoke	51161
South Boston	51780	Halifax	51083
Staunton	51790	Augusta	51015
Waynesboro	51820	Augusta	51015
Williamsburg	51830	James City	51095
Winchester	51840	Frederick	51069

Yellowstone National Park

Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Yellowstone National Park (Part), Montana	30113	Park	30067

Data Sources

Stroke Mortality Data

We obtained death certificate data for 1991–1998 through the National Center for Health Statistics’s (NCHS’s) National Vital Statistics System,² a compilation of statistics from all death certificates filed in the 50 states and the District of Columbia. Stroke deaths were defined as those for which the underlying cause of death listed on the death certificate was cerebrovascular disease, defined according to the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*.³ The *ICD-9-CM* codes for cerebrovascular disease are 430–438. For each decedent, underlying cause of death, age, race, ethnicity, gender, and county of residence at the time of death were abstracted from computerized death certificate files. Information on Hispanic ethnicity was not routinely collected on death certificates in Oklahoma during 1991–1998 or in New Hampshire before 1993. Consequently, we could not analyze the data for decedents of Hispanic ethnicity in Oklahoma or New Hampshire.

Population Data

We obtained population data for all U.S. counties from the U.S. Bureau of the Census for 1991–1998. These postcensal estimates were calculated by the U.S. Bureau of the Census through extrapolation of linear trends in population growth and intercounty migration patterns between the 1980 and 1990 censuses.

Map Projections

National Maps

We used several different map projections to produce the U.S. maps in this publication. For the contiguous United States, an Albers Conic Equal Area projection was used. For Alaska, the Miller’s Cylindrical projection was used, and the Hawaii map uses geographic coordinates (latitude and longitude). Neither Alaska nor Hawaii is in proper geographic scale relative to the continental United States on the national maps. The

combination of different projections and scales allowed for presentation of a relatively familiar orientation of these geographic features.

The coordinate information for the contiguous 48 states was projected using the Albers Conic Equal Area projection with the following parameters:

Spheroid: Clarke 1866	Central Meridian: -96.000
1 st Standard Parallel: 29.500	2 nd Standard Parallel: 45.500
False Easting: 0.000	False Northing: 0.000
Reference Latitude: 37.500	

The coordinate information for Alaska used the Miller's Cylindrical projection with the following parameters:

Spheroid: Sphere	Central Meridian: 0.000
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State Maps

All state maps were projected using the State Plane coordinate system. Each state map is presented at a size designed to maximize the reader's ability to interpret the data. Thus, the maps are not in accurate geographic scale relative to one another. Because State Plane systems are commonly used by state agencies, their use here maximizes the reader's ability to compare these maps with information from other sources.

Race and Ethnicity Definitions

The race and ethnicity categories used in this publication are based on definitions established in 1977 by Directive 15 of the Office of Management and Budget (OMB), which is the federal agency that defines standards for government publications.⁴ The categories are not based on biological or anthropological concepts. "Hispanic" is considered a designation of ethnicity, not race, and people of Hispanic origin

can be of any race. OMB developed these categories in response to the need for standardized data for record keeping and data collection and presentation by federal agencies (e.g., to conduct federal surveys, collect decennial census data, and monitor civil rights laws).

In 1997, OMB issued new race and ethnicity categories following criticism that the categories did not reflect the country's increasing diversity. All federal agencies were instructed to begin collecting and analyzing data using the new categories no later than January 1, 2003. However, the census and vital statistics data used in this publication were collected before the 1997 directive was implemented. Consequently, the racial and ethnic categories analyzed here are consistent with the 1977 directive.

The 1977 race and ethnicity categories are as follows:

- **American Indian or Alaska Native.** A person having origins in any of the original peoples of North America and who maintains tribal affiliation or community attachment.
- **Asian or Pacific Islander.** A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands (e.g., China, India, Japan, Korea, the Philippine Islands, Samoa).
- **Black.** A person having origins in any of the black racial groups of Africa.
- **Hispanic.** A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.
- **White.** A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

Spatial Geometry

The geographic database used in this publication came from the Environmental Systems Research Institute's (ESRI's) ArcUSA database, which includes spatial geometry and characteristics of all U.S. counties.

ESRI modified the 1973 Digital Line Graph source data produced by the U.S. Geological Survey to update county boundaries through 1988. The geographic scale of the spatial geometry (i.e., linework) used is 1:2 million, which is sufficient to identify major county features. Mortality and population data were linked to county geography using FIPS codes.

Calculation of Spatially Smoothed and Age-Adjusted Stroke Death Rates

Rationale for Spatial Smoothing

Although county death rates provide a high degree of spatial specificity, rates in counties with small populations and few stroke deaths can be unstable. This problem is particularly relevant when examining geographic disparities among racial and ethnic groups because many counties have small or nonexistent populations of minority groups. We used two approaches to reduce the statistical instability of county death rates for stroke: (1) temporal aggregation of the 1991–1998 data and (2) application of a statistical procedure known as spatial smoothing.

We chose to spatially smooth stroke death rates using a spatial moving average. Stroke deaths (numerators) and population counts (person-year denominators) for each county were combined with the deaths and population counts of the immediate neighboring counties (i.e., contiguous counties) and then divided to produce an average rate. Thus, a single county's stroke mortality rate actually represents an average of the rates of that county and all its contiguous neighbors.

Calculation of Death Rates

Spatially smoothed and age-adjusted stroke death rates were calculated at the county level by gender and for each of the following racial and ethnic groups: American Indians and Alaska Natives, Asians and Pacific Islanders, blacks, Hispanics, and whites. Rates were also calculated for the total U.S. population. Stroke deaths were obtained from the National Vital Statistics System and included all deaths for which the underlying cause of death reported on the death certificates was listed as *ICD-9-CM*

codes 430–438. Population data were obtained from the U.S. Bureau of the Census.

For each county, stroke deaths (numerators) and population counts (denominators) for 10-year age groups (i.e., ages 35–44, 45–54, 55–64, 65–74, 75–84, and ≥ 85 years) were summed for 1991–1998. County numerators and denominators were then combined with numerators and denominators of all neighboring counties. Neighboring counties were defined solely by contiguity (as opposed to distance). The combined numerators were divided by the combined denominators to produce spatially smoothed, age-specific (i.e., by 10-year age group) stroke death rates. These spatially smoothed rates were then directly age-adjusted to the 2000 U.S. population for the age groups 35 years and older. These calculations were repeated separately by gender for each of the racial and ethnic groups.

Two constraints were applied to the calculation of county stroke death rates for each racial and ethnic group. For a particular racial and ethnic group (e.g., American Indians and Alaska Natives ages 35 years and older), a stroke death rate was not calculated for any county for which the total number of stroke deaths for that group in that county plus its neighbors was fewer than 20 during 1991–1998.⁵ To avoid calculating rates for counties that had no members of a particular population group but whose neighbors had significant populations, rates were calculated only for counties with a population count of 5 or more during 1991–1998 (i.e., person-years were ≥ 5).

Information on Hispanic ethnicity was not routinely collected on death certificates in Oklahoma during 1991–1998 or before 1993 in New Hampshire. Consequently, we removed all counties in Oklahoma and New Hampshire from the contiguity matrix when we spatially smoothed the rates for Hispanics, and no death rates for Hispanics were calculated for Oklahoma and New Hampshire.

Standard Population Weights

Because we calculated directly age-adjusted stroke death rates for people ages ≥ 35 years and not for the entire age range of the population,

we had to recalculate the standard weights for the 2000 U.S. standard population. New weights for age groups 35–44 through ≥85 years were calculated using a two-step procedure. First, we calculated the sum of the original 2000 standard weights for 10-year age groups 35–44

2000 U.S. Projected Standard Population Weights

Age Group (yrs)	Weight
All ages	1.000000
<1	0.013818
1	0.013687
2–4	0.041630
5	0.014186
6–8	0.042966
9	0.015380
10–11	0.030069
12–14	0.042963
15–17	0.043035
18–19	0.029133
20–24	0.066478
25–29	0.064530
30–34	0.071044
35–39	0.080762
40–44	0.081851
45–49	0.072118
50–54	0.062716
55–59	0.048454
60–64	0.038793
65–69	0.034264
70–74	0.031773
75–79	0.027000
80–84	0.017842
≥85	0.015508

through ≥85 years. Second, for each age group, we divided the original weight by the sum of the weights for ages ≥35 years. The resulting quotients are the new standard population weights. The weights were rounded to two decimal places and used to calculate directly age-adjusted stroke death rates for people ages ≥35 years.

2000 U.S. Projected Standard Population Weights for Age Groups ≥35 Years

Age Group (yrs)	Weight
35–44	0.32
45–54	0.26
55–64	0.17
65–74	0.13
70–84	0.09
≥85	0.03

Reporting of Hispanic Origin on Death Certificates in New York City

During 1991–1993, information on Hispanic origin was not reported on an average 18% of stroke death certificates for adults ages 35 years and older residing in New York City. During 1994–1998, the percentage of death certificates missing this information decreased to <3%. After examining New York City death certificate data for 1991–1998, we concluded that most deaths with “unknown” Hispanic origin occurred among non-Hispanic adults.

Our calculations indicated that the percentage of stroke deaths among Hispanic adults increased slightly from 1991–1993 to 1994–1998, whereas the percentage of stroke deaths for non-Hispanic adults increased markedly after reporting improved in 1994. However, because a proportion of the deaths with missing Hispanic origin data occurred among Hispanic adults, the stroke death rates reported here for Hispanic adults are likely underestimated. Erroneous reporting of Hispanics as white on death certificates also causes rates to be underestimated for

Distribution of Stroke Deaths by Hispanic Origin Among Persons Ages ≥35 Years, New York City

Year	Hispanic Origin		
	Non-Hispanic	Hispanic	Unknown
1991	73.8%	9.9%	16.4%
1992	69.3%	11.7%	19.0%
1993	69.0%	11.4%	19.6%
1994	84.6%	13.2%	2.3%
1995	83.3%	15.2%	1.5%
1996	82.6%	15.9%	1.6%
1997	83.9%	14.2%	1.9%
1998	82.4%	15.9%	1.8%

Hispanics (see Section 1). The extent of underestimation may have varied among the five city boroughs, so readers should be prudent when comparing county rates.

Contiguity Matrix for Alaska

We used the contiguity matrix for all U.S. counties from the 1996 Area Resource File database to perform spatial smoothing of stroke mortality rates for this publication. However, this database did not include information for counties in Alaska because Alaska was considered to be a

FIPS Codes for Alaska's 23 Counties	FIPS Codes for Neighboring Counties*							
	1	2	3	4	5	6	7	8
2010	2164							
2020	2170	2261	2122					
2050	2070	2270	2170	2164	2290	2122		
2060	2164	2070						
2070	2164	2060	2050					
2090	2290	2240						
2100	2231	2110						
2110	2100	2280						
2122	2020	2170	2050	2164	2150	2261		
2130	2201	2280						
2150	2122	2164						
2164	2060	2070	2050	2122	2010			
2170	2290	2240	2261	2020	2050	2122		
2180	2270	2290	2188					
2185	2188	2290						
2188	2185	2290	2180					
2201	2280	2130						
2220	2231	2280						
2231	2261	2100	2220	2110	2280			
2240	2290	2090	2170	2261				
2261	2240	2170	2020	2231	2122			
2270	2290	2050	2180					
2280	2220	2201	2231	2130				
2290	2185	2188	2270	2050	2170	2240	2090	2180

*Each county can be bordered by as few as 1 or as many as 8 neighboring counties.

single geographic unit. Because we are interested in the geographic patterns of stroke mortality within the state, we created our own contiguity matrix for the counties in Alaska.

1. National Institute of Standards and Technology. *Federal information processing standards publication 55-3: codes for named populated places, primary county divisions, and other locational entities of the United States, Puerto Rico, and the outlying areas*. Gaithersburg: US Department of Commerce, National Institute of Standards and Technology; 1994. Available on the Internet at <http://www.itl.nist.gov/fipspubs/fip55-3.htm>. Accessed June 12, 2002.
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4. Wallman KK, Hodgdon J. Race and ethnic standards for federal statistics and administrative reporting. *Statistical Reporter* 1977;77(10):450-4.
5. Hoyert DL, Arias E, Smith BL, Murphy SL, Kochanek KD. Deaths: final data for 1999. *National Vital Statistics Reports* 2001;49(8):110.