©Bob Daemmrich/The Image Works

B Methodological and Technical Notes

County Definitions

We used Federal Information Processing Standard (FIPS)[1] codes to link county definitions across multiple data sets in this atlas. To ensure accurate linking of counties across the data sets, the following modifications were made:

Independent Cities

The following independent cities were retained in the geographic database as discrete entities separate from adjacent counties.

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

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code

Hawaii

Original County	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[2] 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
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

Continued on next page

Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPS Code
Norfolk	51710	Norfolk	51129
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

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

Data Sources

Heart Disease and Stroke Mortality Data

We obtained death certificate data through the National Center for Health Statistics' National Vital Statistics System, which is a compilation of statistics from all death certificates filed in the 50 states and the District of Columbia.[3] Heart disease deaths were defined as those for which the underlying cause of death listed on the death certificate was diseases of the heart, defined according to the *International Classification of Diseases* (*ICD-9* codes 390–398, 402, and 404–429; *ICD-10* codes I00–I09, I11, I13, I20–I51).[4,5] Stroke deaths were defined as those for which the underlying cause of death listed on the death certificate was cerebrovascular disease (*ICD-9-CM* codes 430–438).[4] 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.

Population Data

For heart disease mortality rates during 1996–2000, we used postcensal population estimates for 1996–1999 and a special "bridged-race" version of the 2000 census population estimates that allowed us to aggregate the data across 1996–2000. CDC's National Center for Health Statistics has produced bridged-race versions of 2000 census data to allow comparisons between these data and earlier reports, which used fewer race/ethnicity categories (see the **Definition of American Indians and Alaska Natives** section on pages 64–65 of this appendix for a discussion of race/ethnicity categories used for federal data collection).[6] For stroke mortality rates during 1991–1998, we used postcensal estimates 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

We used several different map projections to produce the county-level 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. For the Hawaii map, we used 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
1st Standard Parallel: 29.500
False Easting: 0.000
Reference Latitude: 37.500
Central Meridian: -96.000
2nd Standard Parallel: 45.500
False Northing: 0.000

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

Spheroid: Sphere Central Meridian: 0.000

Definition of American Indians and Alaska Natives

The definition for American Indian and Alaska Native (AI/AN) people used in this publication is based on the definition 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.[7] The categories are not based on biological or anthropological concepts. OMB developed categories for racial and ethnic groups 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 definition for American Indian or Alaska Native is as follows: A person having origins in any of the original peoples of North America and who maintains tribal affiliation or community attachment.

Spatial Geometry

The geographic database used for the county-level maps in this publication came from the Environmental Systems Research Institute's (ESRI) 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 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 heart disease or stroke deaths can be unstable. This problem is particularly relevant when examining geographic disparities among AI/AN populations because many counties have small or nonexistent numbers of this population. We used two approaches to reduce the statistical instability of county death rates for heart disease and stroke: 1) temporal aggregation of the data (1996–2000 for heart disease, 1991–1998 for stroke) and 2) application of a statistical procedure known as spatial smoothing.

We chose to spatially smooth heart disease and stroke death rates using a spatial moving average. The number of 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. We used the contiguity matrix for all U.S. counties from the 1996 Area Resource File database to identify contiguous counties and to perform spatial smoothing. Thus, a single county's heart disease or stroke mortality rate actually represents an average of the rates of that county and all of its contiguous neighbors.

Calculation of Death Rates

Spatially smoothed and age-adjusted death rates were calculated at the county level for all AI/AN people and again for AI/AN women and men separately. Heart disease and 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 diseases of the heart (*ICD-9-CM* codes 390–398, 402, or 404–429: *ICD-10* codes I00–I09, I11, I13, or I20–I51) or cerebrovascular disease (*ICD-9-CM* codes 430–438).[4,5] Population data were obtained from the U.S. Bureau of the Census.

For each county, 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 across the years. County numerators and denomi-

nators 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) death rates. These spatially smoothed rates were then directly age-adjusted to the 2000 U.S. population for 10-year age groups starting at 35. These calculations were repeated separately by gender.

Two constraints were applied to the calculation of county death rates. A stroke death rate was not calculated for any county for which the total number of stroke deaths in that county plus its neighbors was fewer than 20 during 1991–1998.[8] A heart disease death rate was not calculated for any county for which the total number of heart disease deaths in that county plus its neighbors was fewer than 20 during 1996–2000. To avoid calculating rates for counties that had no AI/AN population but whose neighboring counties had significant populations, rates were calculated only for counties with a population count of 5 or more (i.e., person-years were ≥5) during 1996–2000 for heart disease and 1991–1998 for stroke.

Unfortunately, death rates could not be adjusted to account for misreporting of AI/AN people as "white" on death certificates (see the **Introduction**, page 2, for a discussion of this issue). Although the Indian Health Service (IHS) has established a series of weights that can be used to estimate more accurate death rates for AI/AN populations, these weights are designed to be applied to IHS areas, not U.S. counties.[9] Because the weights were calculated on the basis of deaths from all causes combined, even the adjusted heart disease and stroke death rates for AI/AN people may still be less than the true rates for this population.[10]

Standard Population Weights

Because we calculated directly age-adjusted heart disease and stroke death rates for people ages 35 years and older, but 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 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 death rates for people ages ≥35 years.

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

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

Age Group (yrs)	Weight
45–54	0.26
65–74	0.13
≥85	0.03

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 heart disease and stroke mortality rates for this publication. However, this database did not include information for counties in Alaska, because Alaska was considered to be a single geographic unit. Because we are interested in the geographic patterns of heart disease and stroke mortality within the state, we created the following contiguity matrix for the counties in Alaska:

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 one or as many as eight neighboring counties.

Data Source

We obtained data for eight important risk factors for heart disease and stroke from the Behavioral Risk Factor Surveillance System (BRFSS). BRFSS data are collected monthly by state departments of health through telephone interviews of noninstitutionalized adults aged 18 years or older. The states use a multistage design for stratified random sampling of the telephone numbers dialed. Complete details of the BRFSS methodology have been published elsewhere.[11–13]

The BRFSS includes a set of core questions that are asked every year in all states, as well as a set of rotating core questions that are asked every other year. This publication presents prevalence data for the following risk factors included in the annual core questions: diabetes, cigarette smoking, obesity, physical inactivity, and poor health. From the rotating questions that are asked in odd-numbered years, it presents data on high blood pressure, high blood cholesterol, and cholesterol screening.

BRFSS core questions are available in English and Spanish. If the interviewer determines that the respondent is not proficient in either language, the interviewer does not administer the survey and notes that the interview was ended because of a language barrier.

Once the monthly state data are collected, they are sent to CDC to be edited and checked for accuracy. CDC staff members aggregate the monthly data files for each state to create annual totals. These totals are then weighted according to the respondents' probability of being sampled, given the race, age, and gender of the population from which they were selected. Weighting is based on the most current census data for each state. The prevalence of each risk factor for each state is calculated from the weighted data.

Because of the small number of AI/AN respondents in the BRFSS, we combined data for 2001–2003 to increase the precision of our estimates. Prevalence estimates for states that reported fewer than 50 AI/AN respondents were considered unreliable and are not presented in this publication.[14]

Telephone Coverage

A recent study indicates that about 17% of AI/AN people do not have telephones in their homes.[15] This percentage is higher than that of any other U.S. racial/ethnic group. The percentages within this population vary sharply depending on where people live; only 47% of AI/AN people living on reservations have telephones compared with 75% of those who live in rural areas and 88% of those who live in urban areas.[15,16]

Other studies have found that AI/AN people who live in households without telephones are more likely to be physically inactive and to smoke cigarettes.[17–19] Therefore, the findings reported in this atlas are more likely to represent AI/AN people who live in urban areas and not on reservations, and they likely underestimate the prevalence of some risk factors for heart disease and stroke.

Definition of Risk Factors

For this publication, we defined eight risk factors for heart disease and stroke on the basis of specific questions from the BRFSS during 2001–2003. As of 1996, state health departments also can ask about regular aspirin use, prior history of heart disease, and prior history of stroke on their BRFSS questionaires. However, only a few states do so, and many of these states do not have large enough AI/AN populations to generate stable estimates. Therefore, data for these heart disease and stroke risk factors are not included in this atlas.

Map Projection

We combined two map projections to produce the risk factor 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. Neither Alaska nor Hawaii is in proper geographic scale relative to the continental United States on the risk factor maps. The combination of different projections and scales allowed for presentation of a relatively familiar orientation of these geographic features.

Definition of American Indians and Alaska Natives

Respondents to the BRFSS were asked to select a race of origin from the following list: White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian/Alaska Native, or Other (Specify). Only those respondents selecting American Indian/Alaska Native were included in this atlas.

Spatial Geometry

The geographic database used for the risk factor maps in this publication came from the Environmental Systems Research Institute's (ESRI) ArcUSA database, which includes spatial geometry and characteristics of all U.S. counties. The geographic scale of the spatial geometry used is 1:42,874,983, which is sufficient to identify state features.

Risk Factor	Definition
High Blood Pressure	Based on "yes" responses to the following question: "Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?"
High Cholesterol	Based on "yes" responses to the following question: "Have you ever been told by a doctor or other health professional that your blood cholesterol is high?"
Cholesterol Screening	Based on "yes" responses to the following question: "Have you ever had your blood cholesterol checked?"
Diabetes	Based on "yes" responses to the following question: "Have you ever been told by a doctor that you have diabetes?"
Cigarette Smoking	Based on "yes" responses to the following question: "Have you smoked at least 100 cigarettes in your entire life?" Respondents who answered "yes" were then asked, "Do you now smoke every day, some days, or not at all?" People who reported smoking at least 100 cigarettes in their lifetime and smoking now every day or some days were defined as current smokers.
Obesity	Based on the following calculation of body mass index (BMI) from self-reported height and weight: {[weight in lbs. x 0.4536]/[(height in inches x 0.2540)2]} x 100. BMI ≥30.0 was considered obese.
Physical Inactivity	Based on "no" responses to the following question: "During the past month, other than your regular job, did you participate in any physical activities or exercise such as running, calisthenics, golf, gardening, or walking for exercise?"
Poor Health	Based on people who answered "poor" to the following question: "Would you say that in general your health is excellent, very good, good, fair, or poor?"

Calculation of Prevalence Estimates

Because of the complex survey methodology used to produce prevalence estimates for this publication, we used SUDAAN statistical software to calculate standard errors and 95% confidence intervals. The prevalences reported in this atlas are weighted according to the respondents' probability of being sampled, given the race, age, and gender of the state population from which they were selected. No statistical tests were performed for comparison, so the findings of this publication should be considered descriptive in nature.

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, MD: U.S. Department of Commerce; 1994. Available at http://www.itl.nist.gov/fipspubs/fip55-3.htm.
2. Bureau of Health Professions. *Area Resource File*. Rockville, MD: U.S. Department of Health and Human Services, Health Resources and Services Administration; 1996. Available at http://www.arfsys.com.
3. CDC. National Vital Statistics System Web site. Available at http://www.cdc.gov/nchs/nvss.htm.
4. U.S. Department of Health and Human Services. *The International Classification of Diseases, 9th Revision, Clinical Modification*. Washington, DC: Public Health Service, Health Care Financing Administration; 1980. HHS publication no. (PHS) 80-1260.
5. World Health Organization. *International Classification of Diseases and Related Health Problems, 10th Revision, Clinical Modification*. Geneva: World Health Organization; 1992.
6. CDC. National Center for Health Statistics Web site. U.S. Census Populations with Bridged Race Categories: Bridged-Race Population Estimates for April 1, 2000. Available at http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm.
7. Wallman KK, Hodgdon J. Race and ethnic standards for federal statistics and administrative reporting. *Statistical Reporter* 1977;77(10):450–454.
8. Hoyert DL, Arias E, Smith BL, Murphy SL, Kochanek KD. Deaths: final data for 1999. *National Vital Statistics Reports* 2001;49(8):110.
9. Indian Health Service. *Adjusting for Miscoding of Indian Race on State Death Certificates*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service; 1996.
10. Rhoades DA. Racial misclassification and disparities in cardiovascular disease among American Indians and Alaska Natives. *Circulation* 2005;111(10):1250–6.
11. CDC. *Technical Information and Data: BRFSS User's Guide*. Atlanta: U.S. Department of Health and Human Services; 1998. Available at http://www.cdc.gov/brfss/technical_infodata/usersguide.htm.
12. Holtzman D. Analysis and interpretation of data from the U.S. Behavioral Risk Factor Surveillance System (BRFSS). In: McQueen DV, Puska P, et al. *Global Behavioral Risk Factor Surveillance*. New York: Kluwer Academic/Plenum Publishers; 2003:35–46.
13. Mokdad AH, Stroup DF, Giles WH. Public health surveillance for behavioral risk factors in a changing environment: recommendations from the Behavioral Risk Factor Surveillance Team. *Morbidity and Mortality Weekly Report* 2003;52(RR-9).
14. CDC. *2000 BRFSS Summary Prevalence Report*. Atlanta: U.S. Department of Health and Human Services; May 2001:9. Available at http://www.cdc.gov/brfss/pubrfdat.htm.
15. National Telecommunications and Information Administration. *Falling Through the Net: Defining the Digital Divide*. Washington, DC: U.S. Department of Commerce; 1999.
16. Bureau of the Census. Housing of American Indians on reservations—equipment and fuels. *Bureau of the Census Statistical Brief* 1995. Publication no. SB/95-11.
17. Pearson D, Cheadle A, Wagner E, Tonsberg R, Psaty BM. Differences in sociodemographic, health status, and lifestyle characteristics among American Indians by telephone coverage. *Preventive Medicine* 1994;23(4):461–4.
18. Cheadle A, Pearson D, Wagner E, Psaty BM, Diehr P, Koepsell T. Relationship between socioeconomic status, health status, and lifestyle practices of American Indians: evidence from a Plains reservation population. *Public Health Reports* 1994;109(3):405–13.
19. Peterson DE, Remington PL, Kuykendall MA, Kanarek MS, Diedrich JM, Anderson HA. Behavioral risk factors of Chippewa Indians living on Wisconsin reservations. *Public Health Reports* 1994;109(6):820–3.