

# Fire Risk in 2004

These short topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in USFA's National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information.

## Findings

- **Risk by age:** Adults aged 45 and older have a greater risk of dying in fires than the general population. The elderly aged 85 and over have the highest risk of fire death. The risk of fire injury is greatest in the 20 to 49 age range. Young adults aged 20 to 24 have the highest risk of fire injury.
- **Risk by gender:** Men are 1.5 times more likely to die in a fire than women.
- **Risk by race:** African-Americans and American Indians/Alaska Natives are at much greater risk of death in a fire than the general population.
- **Risk by region:** The risk of dying in a fire in the South is higher than in other regions of the United States.
- **Risk by economic factor:** Populations at the lowest income levels are at a greater risk of dying in a fire than those with higher incomes.

The risk from fire is not the same for everyone. Nearly 4,000 deaths and 17,875 injuries in the United States were caused by fire in 2004.<sup>1</sup> These casualties were not distributed equally across the U.S. population, and the resulting risk of death or injury from fire is not uniform—it is more severe for some groups than for others. Much can be learned from understanding why different segments of society are at heightened risk from the fire problem. This Topical Fire Report explores fire risk as it applies to fire casualties in the U.S. population. It is an update to *Fire Risk*, Volume 4, Issue 7.

Risk is a factor, element, or course of action involving uncertainty. It is an exposure to some peril, and it often implies a probability of occurrence, such as investment risk or insurance risk. In terms of the fire problem, risk is the potential for injury or death of a person or damage or loss to property.

This topical report focuses on how fire risk, specifically the risk of death and injury, varies with age, and how other demographic and socioeconomic factors weigh upon that risk.

## Per Capita Rates, Risk, and Fire Casualties

When determining fire risk, age, geographic, demographic, and socioeconomic factors all come into play. People in the South, older adults (aged 65 and over), the very young, and

the poor all are at higher risk of being injured in a fire than the rest of the population. Males, African-Americans, and American Indians/Alaska Natives have a considerably higher risk of death or injury from fire than does the population as a whole. These groups have remained at higher risk despite considerable long-term reductions in fires and fire casualties.

Fire casualties across population groups can be assessed in several ways. The simplest method is to look at the distribution of the numbers of deaths or injuries across the factor of interest. In the case of age, the number of fire deaths is greatest for the very young, the very old, and older middle-aged adults, while most fire injuries occur among adults under age 50.<sup>2</sup> In the case of race, the number of fire deaths is greatest for white Americans and least for American Indians/Alaska Natives.

Although these findings are informative, they do not account for differences in the basic population groups under comparison. In the case of age, as an age group matures its population decreases as a result of deaths and fatal injuries.<sup>3</sup> In the case of race, there are far fewer Asian-Americans, for example, than white Americans living in the United States. As a consequence, it is possible for an age group to have greater (or fewer) injuries or deaths because the sheer number of individuals possible to be injured is larger (or smaller) than other groups.

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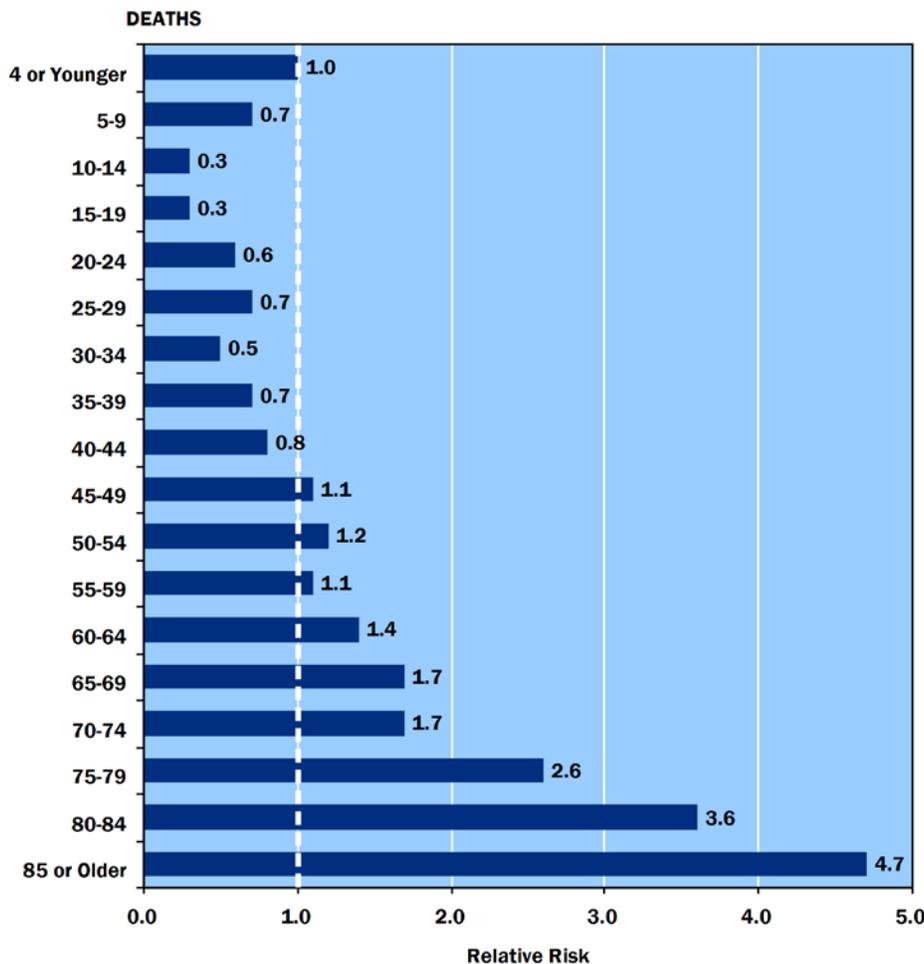
To account for population differences such as these, per capita rates are used. Per capita rates use a common population size, which then permits comparisons among different groups.<sup>4</sup> Perhaps the most useful way to assess fire casualties across groups is to determine the relative risk of dying or being injured. Relative risk compares the per capita rate for a particular group (e.g., females) to the overall per capita rate (i.e., the general population). The result is a measure of how likely a group is to be affected.

For the general population, the relative risk is set at 1. The relative risk of dying in a fire for the total population of females in comparison to the total population is 0.8, which is equivalent to the per capita fire death rate for females (10.6) divided by the per capita fire death rate for the entire population (13.6). Thus the relative risk of a female dying from fire is 20% less than that of the total population.

### Age and Risk of Fire Casualty

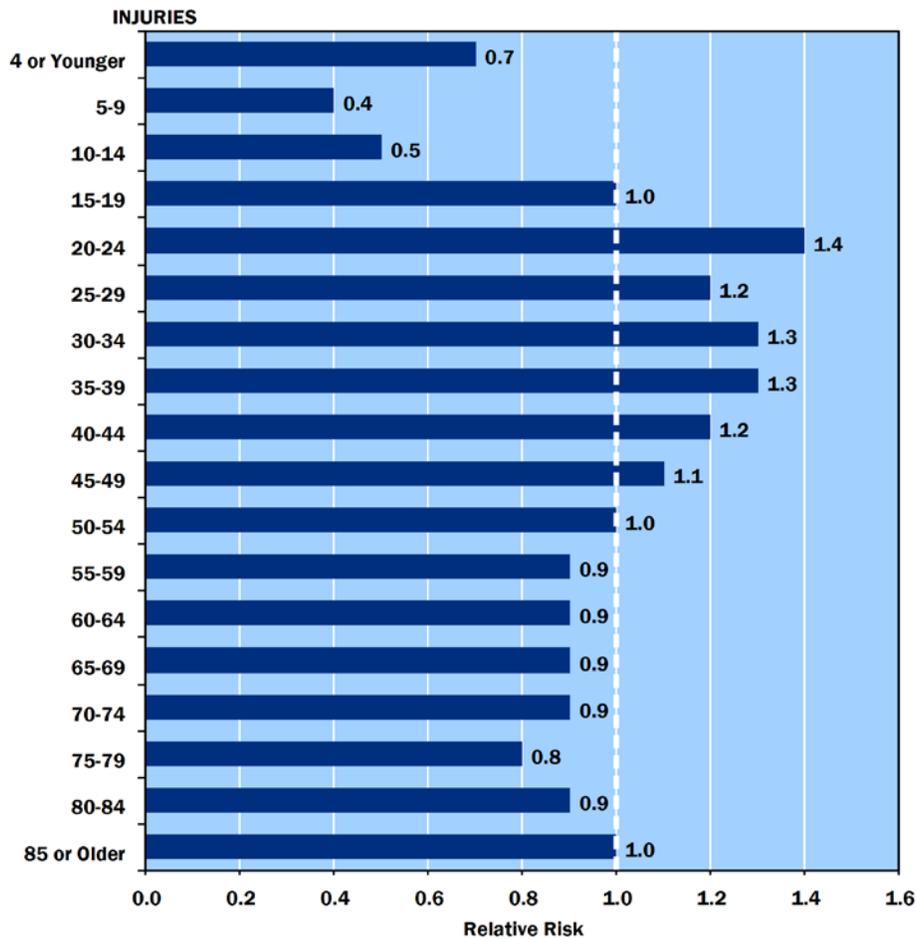
When physical and cognitive abilities are limited, as is often the case for the very young and the very old, the risk of death and injury from fire rises. Older adults experience large numbers of fire deaths in a small population group. As a result, the risk for the elderly of dying in a fire is 2.6 times higher than for the population as a whole, and rises even more for the oldest segment (Figure 1). Individuals aged 65 to 74 are 1.7 times more likely to die in a fire than the general population, while those adults aged 85 or older are 4.7 times more likely to suffer fire-related deaths. Increasing frailty and infirmity accompany aging, and the tendency of fire death and injury risk to rise with greater age is not surprising.<sup>5</sup> Approximately 2,025 older adults (65 and older) were injured and 1,265 died in fires in 2004.<sup>6</sup>

**Figure 1. Relative Risk of Fire Death by Age, 2004.**



Source: National Center for Health Statistics and U.S. Census Bureau.  
 Note: Data have been adjusted to account for deaths with unknown age.

**Figure 2. Relative Risk of Injury by Age, 2004.**



Source: National Fire Incident Reporting System (NFIRS), National Fire Protection Association (NFPA), and U.S. Census Bureau.

Note: Data have been adjusted to account for injuries with unknown age.

Children also experience high numbers of fire deaths. Though the risk of death for children from birth to age 14 is slightly below the risk to the population as a whole, some groups of children are more at risk than others. For children under the age of 5, the risk of fire death is equivalent to that of the general population (Figure 1). As children mature and their cognitive and social abilities develop, the risk of fire death drops sharply. In 2004, children between ages 5 and 9 had two-thirds of the risk of fire death of their younger counterparts; children between 10 and 14 have half that of the group aged 5 to 9. Of the youngest, African-American and American Indian/Alaska Native children are most threatened. Children aged 4 and under also have a greater relative risk of injury from fire (Figure 2) than their older counterparts.<sup>7</sup> Approximately 2,000 children (14 and younger) were injured and 560 killed in fires in 2004.

After age 19, the risk of fire death increases. In 2004, by age 45, the risk of death is above average, and it continues to increase sharply as the population ages. Although the overall numbers change, these profiles have remained relatively constant from year to year, according to the National Center for Health Statistics (NCHS) and U.S. Census Bureau data.

The age profile of risk for fire injuries is very different from that for deaths (Figure 2), with a much narrower range of risk quotients (0.4 to 1.4 versus 0.3 to 4.7 for fire deaths).<sup>8</sup> This difference is thought to be the result of both cognitive and mobility issues that affect children and older adults. As a result, children and older adults are less likely to escape the effects of fire and thus suffer fatal injuries. Middle-aged individuals tend to suffer nonfatal injuries—in 2004, most fire injuries occurred among 30- to 44-year-olds, with a

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spike in the 20- to 24-year-olds.<sup>9</sup> In terms of risk in 2004, the risk of injury in a fire is highest for young adults aged 20 to 24, followed by midlife adults aged 30 to 39. The risk of injury is well below average for children under age 15, and at or below average for adults over age 50 (Figure 2).

**Other Factors That Influence Risk**

In the U.S. Fire Administration’s (USFA’s) report *Socioeconomic Factors and the Incidence of Fire*,<sup>10</sup> socioeconomic studies show an inverse relationship between fire risk and income. The poorer population groups have the highest risk of fire injury or death, while the wealthiest have the lowest. Many elderly people live alone on meager incomes, often in substandard housing stock.<sup>11</sup> Closely tied to income is level of education. Numerous studies, including those associated with the

No Child Left Behind legislation, have demonstrated that groups living in persistent poverty—that is, with income levels below the poverty line for long periods of time—score poorly in educational testing, have higher high school dropout rates, and reduced employment opportunities.

Geographic location also has an effect (Table 1). There is a greater risk of dying in a fire in the South (30%) than other regions.<sup>12</sup> This is, in part, attributed to the intermittent need for heating. Rather than including central heating systems as in northern areas, many households in the South use portable heating devices. By their nature, such heating strategies are more likely to lead to a fire problem. Conversely, the West has a much lower risk of fire death. This reduction may be due, in part, to the role of heating (or lack of) in fire deaths, housing stock characteristics, and other factors.

**Table 1. Relative Risk by Geographic Area, 2004.**

Region	Population	Fire Deaths	Death Rate per Million Population	Relative Risk
Northeast	54,586,281	637	11.7	0.9
Midwest	65,682,645	908	13.8	1.0
South	105,991,954	1,871	17.7	1.3
West	67,377,278	577	8.6	0.6
Overall U.S.	293,638,158	3,993	13.6	1.0

Sources: National Center for Health Statistics (NCHS), 2004 Mortality Data; and Population Division, U.S. Census Bureau: Table 1: Annual Estimates of the Population for the United States, Regions, and States and for Puerto Rico: April 1, 2000 to July 1, 2006 (NST-EST2006-01).

Note: Relative risk may not compute due to rounding.

Like age, gender plays a role in the risk of death or injury from fire. For virtually all age groups, males are more likely to die in a fire-related incident (Table 2, Table 3, and Table 4). Overall, in 2004, men were 1.5 times more likely to die in a fire than women. USFA data from the National Fire Incident Reporting System (NFIRS) also show that men, overall, are about 1.5 times more likely to suffer injuries than their female counterparts. Why this is so is subject to speculation. Men may be more willing to take risks than women, and this behavior could account for some of the difference. Previous NFIRS data indicate that more men than women will try to extinguish a fire. This action alone could account for much of the difference in injury rates.

Race, which may be related to societal factors, cannot be ignored. African-Americans and American Indians/Alaska Natives have noticeably higher death rates per capita than the national average. African-Americans comprise a large and disproportionate share of total fire deaths, accounting for 24% of fire deaths in 2004, but only 13% of the U.S. population.<sup>13</sup> In 2004, African-Americans had nearly twice the relative risk of dying than the general population. For American Indians/Alaska Natives that year, the relative risk also was elevated: 60% higher than the overall risk. By contrast, Asian-Americans are much less likely than the overall population to die in a fire.

**Table 2. Relative Risk of Fire Death by Race and Gender, 2004,  
Overall Population.**

Gender/Race	Population	Fire Deaths	Death Rate per Million Population	Relative Risk
Total	293,638,158	3,993	13.6	1.0
Male	144,467,272	2,408	16.7	1.2
Female	149,170,886	1,585	10.6	0.8
White	236,036,395	2,901	12.3	0.9
African-American	37,472,889	950	25.4	1.9
American Indian/ Alaska Native	2,824,946	60	21.2	1.6
Asian/Pacific	12,861,012	82	6.4	0.5
White Male	116,775,115	1,757	15.0	1.1
African-American Male	17,846,560	570	31.9	2.3
American Indian/ Alaska Native Male	1,414,583	38	26.9	2.0
Asian/Pacific Male	6,244,524	43	6.9	0.5
White Female	119,261,280	1,144	9.6	0.7
African-American Female	19,626,329	380	19.4	1.4
American Indian/ Alaska Native Female	1,410,363	22	15.6	1.1
Asian/Pacific Female	6,616,488	39	5.9	0.4

Sources: See References at the end of the report.

Notes: The overall male and female estimates include individuals with "2+ races" per the Census. The "2+ races" category accounts for approximately 1.5 percent of the population. NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate.

Relative risk may not compute due to rounding.

**Table 3. Relative Risk of Fire Death by Age, Race, and Gender, 2004, Children (Birth to Age 14).**

Gender/Race	Population	Fire Deaths	Death Rate per Million Population	Relative Risk
Total	60,836,501	558	9.2	0.7
Male	31,132,191	314	10.1	0.7
Female	29,704,310	244	8.2	0.6
White	46,446,923	317	6.8	0.5
African-American	9,407,112	212	22.5	1.7
American Indian/ Alaska Native	706,524	13	18.4	1.4
Asian/Pacific	2,515,376	16	6.4	0.5
White Male	23,822,531	182	7.6	0.6
African-American Male	4,774,206	117	24.5	1.8
American Indian/ Alaska Native Male	358,833	9	25.1	1.8
Asian/Pacific Male	1,282,229	6	4.7	0.3
White Female	22,624,392	135	6.0	0.4
African-American Female	4,632,906	95	20.5	1.5
American Indian/ Alaska Native Female	347,691	4	11.5	0.8
Asian/Pacific Female	1,233,147	10	8.1	0.6

Sources: See References at the end of the report.

Notes: The overall male and female estimates include individuals with "2+ races" per the Census. The "2+ races" category accounts for approximately 1.5 percent of the population. NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate.

Relative risk may not compute due to rounding.

**Table 4. Relative Risk of Fire Death by Age, Race, and Gender, 2004, Older Adults (Aged 65+).**

Gender/Race	Population	Fire Deaths	Death Rate per Million Population	Relative Risk
Total	36,309,400	1,263	34.8	2.6
Male	15,157,782	664	43.8	3.2
Female	21,151,618	599	28.3	2.1
White	31,786,451	970	30.5	2.2
African-American	3,046,789	266	87.3	6.4
American Indian/ Alaska Native	181,260	12	66.2	4.9
Asian/Pacific	1,076,331	15	13.9	1.0
White Male	13,358,167	515	38.6	2.8
African-American Male	1,167,494	139	119.1	8.8
American Indian/ Alaska Native Male	79,090	5	63.2	4.6
Asian/Pacific Male	460,426	5	10.9	0.8
White Female	18,428,284	455	24.7	1.8
African-American Female	1,879,295	127	67.6	5.0
American Indian/ Alaska Native Female	102,170	7	68.5	5.0
Asian/Pacific Female	615,905	10	16.2	1.2

Sources: See References at the end of the report.

Notes: The overall male and female estimates include individuals with "2+ races" per the Census. The "2+ races" category accounts for approximately 1.5 percent of the population. NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate.

Relative risk may not compute due to rounding.

## Conclusion

The very young and the very old are some of the Nation's most vulnerable residents. These high-risk groups merit special attention to reduce their risk of injury or death from fire. With an aging population, the U.S. demographic profile is changing rapidly. The elderly population is expected to increase from its current 12.5% of the total population to nearly 20% by midcentury,<sup>14</sup> with an assumed corresponding increase in fire deaths and injuries among older adults.

Because children and older adults account for 46% of fire deaths and 22% of fire injuries, the USFA has been working toward the goal of reducing fire deaths and injuries to children and older adults. A number of resources to help address the fire problem for children and adults are available. USFA's fire safety campaign for babies and toddlers at <http://www.usfaparents.gov> provides parents with home strategies ranging from the control of matches and lighters to home escape planning to protect young children from fire. For adults, A Fire Safety Campaign for People 50-Plus

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(<http://www.usfa.dhs.gov/campaigns/50plus/>) addresses lifestyle strategies of safe smoking, safe cooking, and safe heating to reduce the incidence of fires that traditionally

affect older adults. For further information, see the USFA Web site (<http://www.usfa.dhs.gov>) or contact your local fire department.

To request additional information or to comment on this report, visit <http://www.usfa.dhs.gov/applications/feedback/index.jsp>

## References:

Sources for Table 2, Table 3, and Table 4:

National Center for Health Statistics, 2004 Mortality Data; and U.S. population estimates from the Population Division, U.S. Census Bureau, <http://www.census.gov/popest/national/asrh/>:

- Table 1: Annual Estimates of the Population for the United States, Regions, and States and for Puerto Rico: April 1, 2000 to July 1, 2006 (NST-EST2006-01);
- Table 1: Annual Estimates of the Population by Five-Year Age Groups and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-01);
- Table 3: Annual Estimates of the Population by Sex, Race, and Hispanic or Latino Origin for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-03);
- Table 4: Annual Estimates of the White Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-04-WA);
- Table 4: Annual Estimates of the Black or African-American Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-04-BA);
- Table 4: Annual Estimates of the American Indian and Alaska Native Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-04-IA);
- Table 4: Annual Estimates of the Asian Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-04-AA); and
- Table 4: Annual Estimates of the Native Hawaiian and Other Pacific Islander Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2006 (NC-EST2006-04-NA).

<sup>1</sup> Fire deaths are extracted from the 2004 NCHS mortality data using International Classification of Disease (ICD) codes F63.1, W39–W40, X00–X09, X75–76, X96–97, Y25–26, and Y35.1 where these codes were noted as either the underlying cause of death or a contributing factor in the chain of events leading to death. Under these criteria, 3,993 deaths were extracted. Only deaths where age was specified were used in the analyses in the relative risk tables. Estimates of fire injuries are from the National Fire Protection Association's (NFPA's) annual survey.

<sup>2</sup> *Fire in the United States 1995–2004*, U.S. Fire Administration (USFA), Federal Emergency Management Agency (FEMA), 14th Edition.

<sup>3</sup> Immigration and changes in U.S. overseas populations have an additive effect on a static population group in the early and

midlife years. Over the lifespan of the population group, however, death rates have a larger, decreasing effect.

<sup>4</sup> Per capita rates are determined by the number of deaths or injuries occurring to a specific population group divided by the total population for that group. This ratio then is multiplied by a common population size. For the purposes of this report, per capita rates for fire deaths and injuries are measured per 1 million persons. For example, the per capita fire death rate for the total female population is computed from the total number of female fire deaths (1,585) divided by the total female population (149,170,886) multiplied by 1,000,000 persons. This rate is equivalent to 10.6 deaths per 1 million population.

<sup>5</sup> See both *The Fire Risk to Older Adults*, Topical Report Vol. 4, Issue 9, December 2004; and *Fire Risk to Older Adults in 2004*, Topical Report Vol. 7, Issue 7, February 2008.

<sup>6</sup> Numbers of fire deaths are extracted from NCHS mortality data using the ICD codes noted previously. Estimates of fire injuries are calculated by determining the percent of injuries from the NFIRS data and applying the percentage to the NFPA estimate of fire injuries. Deaths are rounded to the nearest 5; injuries are rounded to the nearest 25.

<sup>7</sup> See also *The Fire Risk to Children*, Topical Report Vol. 4, Issue 8, December 2004; and *Fire Risk to Children in 2004*, Topical Report Vol. 7, Issue 6, February 2008.

<sup>8</sup> Estimates of injuries by age are derived from 2004 NFIRS civilian fire casualty age data (version 5.0) in conjunction with 2004 NFPA estimates of overall fire injuries.

<sup>9</sup> *Fire in the United States 1995–2004*, USFA, FEMA, 14th Edition.

<sup>10</sup> *Socioeconomic Factors and the Incidence of Fire*, USFA, FA 170, June 1997.

<sup>11</sup> *Ibid.*

<sup>12</sup> The regions of the United States are defined by the U.S. Census Bureau as the: Northeast (Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont); South (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia); Midwest (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin); West (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming).

<sup>13</sup> Statistics are based on U.S. Census Bureau population estimates for July 2004.

<sup>14</sup> U.S. Census Bureau population estimates as referenced in *Fire and the Older Adult*, USFA, FA 300, January 2006.