TOPICAL FIRE REPORT SERIES Volume 11, Issue 8 / February 2011

Fire Risk in 2007

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's (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 ages 50 and older have a greater risk of dying in fires than the general population. The elderly ages 85 and over have the highest risk of fire death. The risk of fire injury is greatest in the 20 to 54 age ranges. Adults ages 30 to 34 have the highest risk of fire injury.
- *Risk by gender:* Men are 1.5 times more likely to die in fires 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 other regions of the United States.
- *Risk by economic factor:* Populations at the lowest income levels are at a greater risk of dying in fires than those with higher incomes.

The risk from fire is not the same for everyone. Nearly 4,000 deaths and 17,675 injuries in the United States were caused by fires in 2007.[1] These casualties were not equally distributed 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 a 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 in 2004*, Vol. 7, Issue 5.

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, geographic, demographic, and socioeconomic factors all come into play. People in the South, the poor, and older adults (ages 65 and over) all are at higher risk from dying in a fire than the rest of the population. The very young (ages 4 and younger) are also at higher risk when compared to the overall population of children ages 14 and under. Males, African-Americans, and American Indians/Alaska Natives also have a considerably higher risk of death 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 55.[2] 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 of individuals decreases as a result of deaths and fatal injuries.[3] 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 for whom it is possible to be injured is larger (or smaller) than other groups.

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 between different groups.[4] 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. From this report, the relative risk of dying in a fire for the total population of females in comparison to the total population is 0.8. This is equivalent to the per capita fire death rate for females (10.4 deaths per million population) divided by the per capita fire death rate for the entire population (13.2 deaths per million population[5]). Thus the relative risk of a female dying from fire is 20 percent less than that of the total population.

Data Sources and Methodology

The findings in this report pertaining to deaths were taken from National Center for Health Statistics (NCHS) mortality data from 2007. For each reported death certificate in the United States, NCHS assigns International Classification of Disease (ICD) codes for all reported conditions leading to death. For this report, ICD codes F63.1, W39–W40, X00–X09, X75–76, X96–97, Y25–26, and Y35.1 within NCHS data were analyzed.[6] These codes include all deaths in which exposure to fire, fire products, or explosion was the underlying cause of death or was a contributing factor in the chain of events leading to death. Only deaths where age was specified were used in the analyses in the relative risk tables.

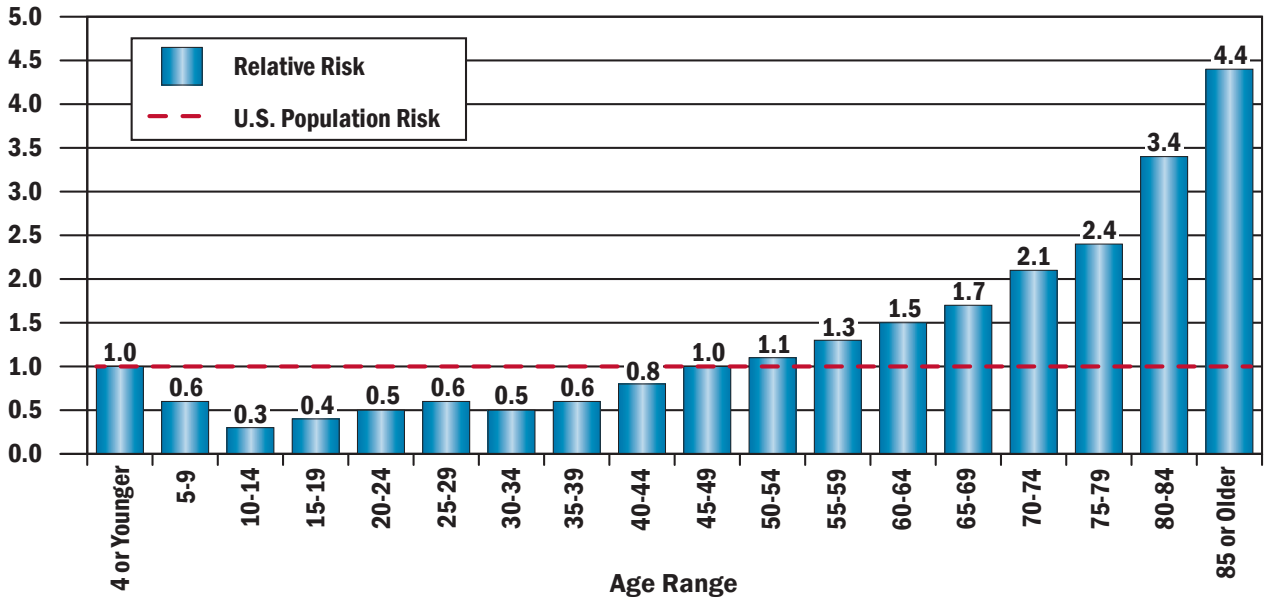
Further, the latest NCHS mortality data available are from 2007, which were released in the late spring of 2010. For this reason, all analyses in this report and the other topical reports in the Risk Series (*Fire Risk to Children in 2007*, Vol. 11, Issue 9, February 2011 and *Fire Risk to Older Adults in 2007*, Vol. 11, Issue 10, February 2011) reference 2007 data for reasons of consistency.

Fire injury estimates in this report are based on data from the 2007 National Fire Incident Reporting System (NFIRS) Version 5.0 and the 2007 National Fire Protection Association (NFPA) survey.

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 (age 65 and over) experience large numbers of fire deaths that occur in a small population group. As a result, the risk of dying in a fire for the elderly is 2.6 times higher than for the population as a whole and rises even more for the oldest segment (Figure 1). Individuals ages 65 to 74 are 1.9 times more likely to die in a fire than the general population, while those adults ages 85 or older are 4.4 times more likely to suffer fire-related deaths. Increasing frailty and infirmity accompany aging, and the tendency of higher fire death and injury risk to rise with greater age is not surprising.[7] Approximately 2,100 older adults (65 and older) were injured and 1,295 died in fires in 2007.[8]

Figure 1. Relative Risk of Fire Death by Age, 2007



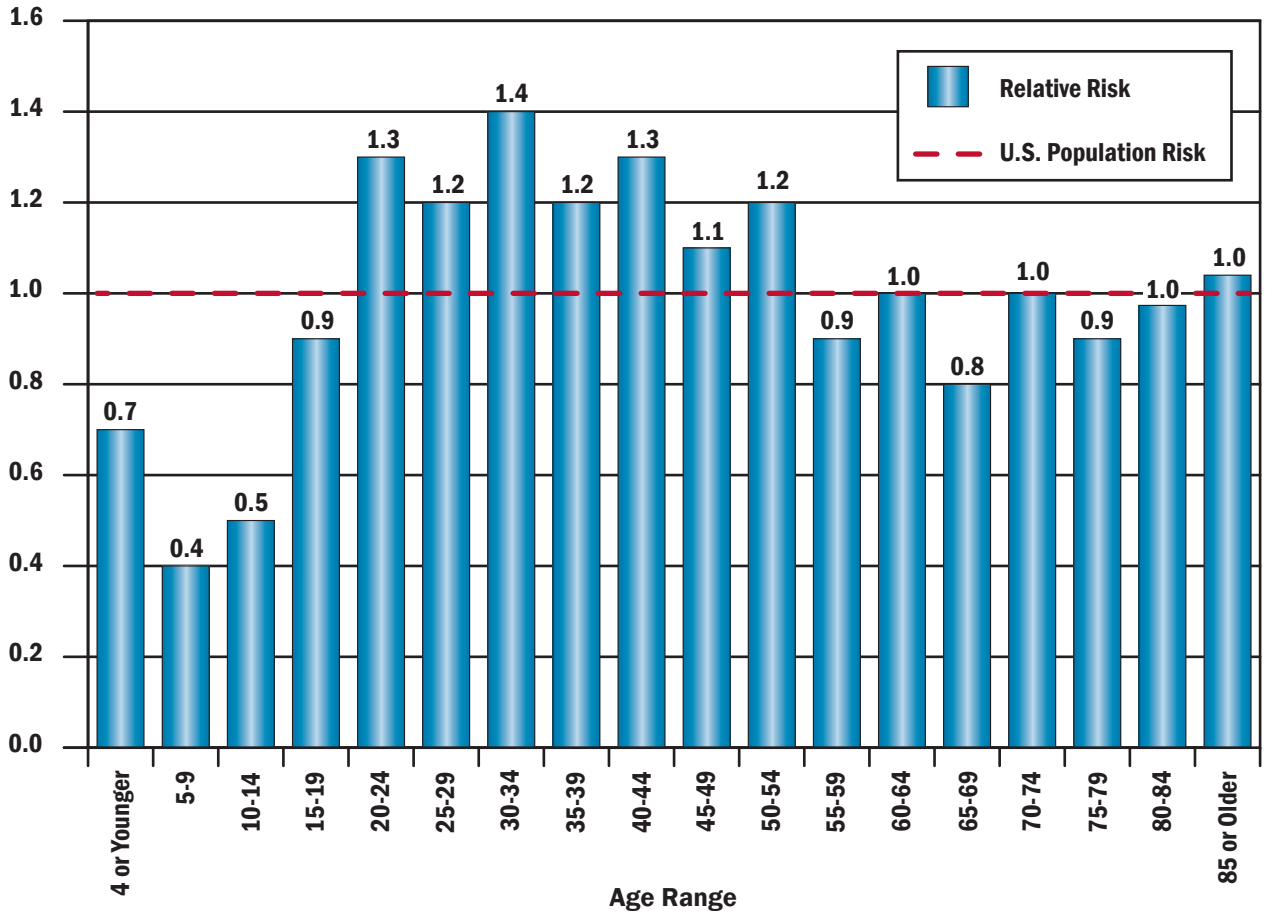
Source: National Center for Health Statistics and U.S. Census Bureau.
Note: Data have been adjusted to account for deaths with unknown age.

Though the risk of death for children from birth to age 14 is below the risk to the population as a whole, some children are more at risk than others. For children ages 4 and under, 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 2007, children between ages 5 and 9 had 60 percent of the risk of fire death of their youngest counterparts; children between 10 and 14 had a little over half that of the 5 to 9 age group. Of the youngest, African-American and American Indian/Alaska Native children are most threatened. Children in the 4 and under age group also have a greater relative risk of injury from fire (Figure 2) than their older counterparts.[9] Approximately 1,900 children (14 and younger) were injured and 510 killed in fires in 2007.

After age 19, the risk of fire death increases. In 2007, by age 50 the risk of death is above average and it continues to increase as the population ages. Although the overall numbers change, these profiles have remained relatively constant from year to year, according to the 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 4.4 for fire deaths).[10] This difference is thought to be both the result of 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 2007, most fire injuries occurred among 20 to 54 year olds, with a spike in the 30 to 34 year olds.[11] The risk of injury is well below average for children under the age of 15 and at or below average for adults over the age of 54 (Figure 2).

Figure 2. Relative Risk of Injury by Age, 2007



Source: NFIRS, National Fire Protection Association (NFPA), and U.S. Census Bureau.
Note: Data have been adjusted to account for injuries with unknown age.

Other Factors That Influence Risk

In the U.S. Fire Administration's (USFA's) report, *Socioeconomic Factors and the Incidence of Fire*,[12] 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.[13] 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. Further, research shows that fire death rates are higher in States with larger percentages of people who are African-American, poor, smokers, have less formal education, and who live in rural areas. Many of these States tend to be in the Southeastern U.S.[14]

Geographic location also has an effect (Table 1). There is a greater risk of dying in a fire in the South (20 percent) than other regions.[15] This is, in part, attributed to the intermittent need for occasional heating. Rather than including central heating systems as in northern areas, many households in the South use portable heating devices for heat. 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, 2007

Region	Population	Fire Deaths	Death Rate (per million Population)	Relative Risk
Northeast	54,879,379	624	11.4	0.9
Midwest	66,359,247	923	13.9	1.1
South	110,573,419	1,827	16.5	1.2
West	69,767,850	620	8.9	0.7
Overall U.S.	301,579,895	3,994	13.2	1.0

Sources: National Center for Health Statistics, 2007 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, 2009 (NST-EST2009-01);
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 2007, men were 1.5 times more likely to die in fires than women. USFA data from NFIRS also show that men, overall, are about 1.5 times more likely to suffer injuries than their female counterparts.[16] The reasons for these findings are 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 23 percent of fire deaths in 2007 but only 13 percent of the U.S. population.[17] In 2007, African-Americans had 80 percent more risk of dying in a fire than the general population, down from nearly twice the risk in 2004. For American Indians/Alaska Natives in 2007, the relative risk was also elevated; 30 percent higher than the overall risk, but down from 60 percent higher risk in 2004. 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, 2007 Overall Population

Gender/Race	Population	Fire Deaths	Death Rate (per million Population)	Relative Risk
Total	301,579,895	3,994	13.2	1.0
Male	148,612,102	2,402	16.2	1.2
Female	152,967,793	1,592	10.4	0.8
White	240,947,306	2,947	12.2	0.9
African-American	38,741,771	917	23.7	1.8
American Indian/Alaska Native	3,037,691	52	17.1	1.3
Asian/Pacific	13,860,386	78	5.6	0.4
White Male	119,428,080	1,778	14.9	1.1
African-American Male	18,484,030	544	29.4	2.2
American Indian/Alaska Native Male	1,523,630	31	20.3	1.5
Asian/Pacific Male	6,711,670	49	7.3	0.6
White Female	121,519,226	1,169	9.6	0.7
African-American Female	20,257,741	373	18.4	1.4
American Indian/Alaska Native Female	1,514,061	21	13.9	1.0
Asian/Pacific Female	7,148,716	29	4.1	0.3

Sources: See Notes 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 1.7 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, 2007 Children (Ages 0 to 14)

Gender/Race	Population	Fire Deaths	Death Rate (per million population)	Relative Risk
Total	61,294,588	509	8.3	0.6
Male	31,356,417	294	9.4	0.7
Female	29,938,171	215	7.2	0.5
White	46,462,664	277	6.0	0.5
African-American	9,229,753	208	22.5	1.7
American Indian/Alaska Native	769,854	8	10.4	0.8
Asian/Pacific	2,793,575	16	5.7	0.4
White Male	23,823,107	161	6.8	0.5
African-American Male	4,684,247	117	25.0	1.9
American Indian/Alaska Native Male	391,580	5	12.8	1.0
Asian/Pacific Male	1,419,336	11	7.8	0.6
White Female	22,639,557	116	5.1	0.4
African-American Female	4,545,506	91	20.0	1.5
American Indian/Alaska Native Female	378,274	3	7.9	0.6
Asian/Pacific Female	1,374,239	5	3.6	0.3

Sources: See Notes 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 1.7 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, 2007 Older Adults (Age 65+)

Gender/Race	Population	Fire Deaths	Death Rate (per million population)	Relative Risk
Total	37,867,145	1,294	34.2	2.6
Male	15,968,607	685	42.9	3.2
Female	21,898,538	609	27.8	2.1
White	32,935,481	1,000	30.4	2.3
African-American	3,231,682	264	81.7	6.2
American Indian/Alaska Native	208,343	15	72.0	5.4
Asian/Pacific	1,242,168	15	12.1	0.9
White Male	13,992,300	526	37.6	2.8
African-American Male	1,243,450	144	115.8	8.7
American Indian/Alaska Native Male	91,928	10	108.8	8.2
Asian/Pacific Male	534,311	5	9.4	0.7
White Female	18,943,181	474	25.0	1.9
African-American Female	1,988,232	120	60.4	4.6
American Indian/Alaska Native Female	116,415	5	42.9	3.2
Asian/Pacific Female	707,857	10	14.1	1.1

Sources: See Notes 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 1.7 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 and, as a result, these 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 older adult population (age 65 and over) is expected to increase from its current 13 percent of the total population to 19 percent by 2030 and to 20 percent by 2040,[18] with an assumed corresponding increase in fire deaths and injuries among older adults.

Because children and older adults account for 45 percent of fire deaths and 23 percent 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 (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 (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 website (http://www.usfa.dhs.gov) or contact your local fire department.

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

Notes:

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

National Center for Health Statistics, 2007 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, 2009 (NST-EST2009-01);
- Table 1: Annual Estimates of the Population by Five-Year Age Groups and Sex for the United States: April 1, 2000 to July 1, 2009 (NC-EST2009-01);
- 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, 2009 (NC-EST2009-03);

- Table 4: Annual Estimates of the White Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2009 (NC-EST2009-04-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, 2009 (NC-EST2009-04-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, 2009 (NC-EST2009-04-IA);
- Table 4: Annual Estimates of the Asian Alone Population by Age and Sex for the United States: April 1, 2000 to July 1, 2009 (NC-EST2009-04-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, 2009 (NC-EST2009-04-NA).

[1] National Center for Health Statistics (NCHS), 2007 Mortality data (deaths); and 2007 National Fire Protection Association (NFPA) survey estimates (injuries).

[2] U.S. Fire Administration (USFA), Federal Emergency Management Agency (FEMA), *Fire in the United States 2003 – 2007*, 15th ed., Released October 2009.

[3] 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.

[4] 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 is then 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 (1,592) divided by the total female population (152,967,793) multiplied by 1,000,000 persons. This rate is equivalent to 10.4 deaths per 1 million population.

[5] The per capita fire death rate for the total population is computed from the total number of fire deaths (3,994) divided by the total population (301,579,895) multiplied by 1,000,000 persons. This rate is equivalent to 13.2 deaths per 1 million population.

[6] The ICD-10 codes used from the NCHS mortality data are as follows: F63.1–Pathological fire-setting (pyromania), W39–Discharge of firework, W40–Explosion of other materials, X00–Exposure to uncontrolled fire in building or structure, X01–Exposure to uncontrolled fire, not in building or structure, X02–Exposure to controlled fire in building or structure, X03–Exposure to controlled fire, not in building or structure, X04–Exposure to ignition of highly flammable material, X05–Exposure to ignition or melting of nightwear, X06–Exposure to ignition or melting of other clothing and apparel, X08–Exposure to other specified smoke, fire, and flames, X09–Exposure to unspecified smoke, fire, and flames, X75–Intentional self harm (suicide) by explosive material, X76–Intentional self harm (suicide) by smoke, fire, and flames, X96–Assault (homicide) by explosive material, X97–Assault (homicide) by smoke, fire, and flames, Y25–Contact with explosive material, undetermined intent, Y26–Exposure to smoke, fire, and flames, undetermined intent, Y35.1–Legal intervention involving explosives.

[7] See also *The Fire Risk to Older Adults*, Topical Report Vol. 4, Issue 9, December 2004, *Fire Risk to Older Adults in 2004*, Topical Report Vol. 7, Issue 7, February 2008, and *Fire Risk to Older Adults in 2007*, Topical Report Vol. 11, Issue 10, February 2011.

[8] 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 National Fire Incident Reporting System (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.

[9] See also *The Fire Risk to Children*, Topical Report Vol. 4, Issue 8, December 2004, *Fire Risk to Children in 2004*, Topical Report Vol. 7, Issue 6, February 2008, and *Fire Risk to Children in 2007*, Topical Report Vol. 11, Issue 9, February 2011.

[10] Estimates of injuries by age are derived from 2007 NFIRS civilian fire casualty age data (version 5.0) in conjunction with 2007 NFPA estimates of overall fire injuries.

[11] USFA, FEMA, *Fire in the United States 2003 – 2007*, 15th ed., Released October 2009.

[12] USFA, *Socioeconomic Factors and the Incidence of Fire*, FA 170, June 1997.

[13] Ibid.

[14] NFPA, Fire Analysis and Research Division, *Demographic and Other Characteristics Related to Fire Deaths or Injuries*, March 2010. http://www.nfpa.org/assets/files/PDF/OS.SocFactors.pdf.

[15] 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).

[16] USFA, FEMA, *Fire in the United States 2003 – 2007*, 15th ed., Released October 2009.

[17] Statistics are based on U.S. Census Bureau population estimates for July 2007.

[18] Department of Health and Human Services (HHS), Administration on Aging, http://www.aoa.gov/AoARoot/Aging_Statistics/future_growth/docs/by_Age_65_And_Over.xls. Release Date: August 14, 2008.