Fire Risk in 2011

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 National Fire Incident Reporting System. 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: In 2011, adults age 50 or older had a greater relative risk of dying in fires than the general population. The elderly age 85 or older had the highest risk of fire death. The relative risk of fire injury was greatest for the 20- to 54-year-olds and those 85 and older, peaking for the 30- to 34-year-olds and the 40- to 44-year-olds. In addition, while lower than the relative risk of the general population, children age 4 and under faced an elevated risk of both injury and death in a fire when compared to older children (age 5 to 14).
- Risk by gender: Males were 1.5 times more likely to die in fires than females.
- Risk by race: African-Americans and American Indians/Alaska Natives were at a greater relative risk of dying in a fire than the general population.
- Risk by region: The relative risk of dying in a fire for people living in the South was higher than for populations living in other regions of the United States.

The risk from fire is not the same for everyone. In 2011, 3,415 deaths and 17,500 injuries in the U.S. were caused by fires.[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 2010," Volume 14, Issue 7; "Fire Risk to Children in 2010," Volume 14, Issue 8; and "Fire Risk to Older Adults in 2010," Volume 14, Issue 9.

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 of property as a result of fire.

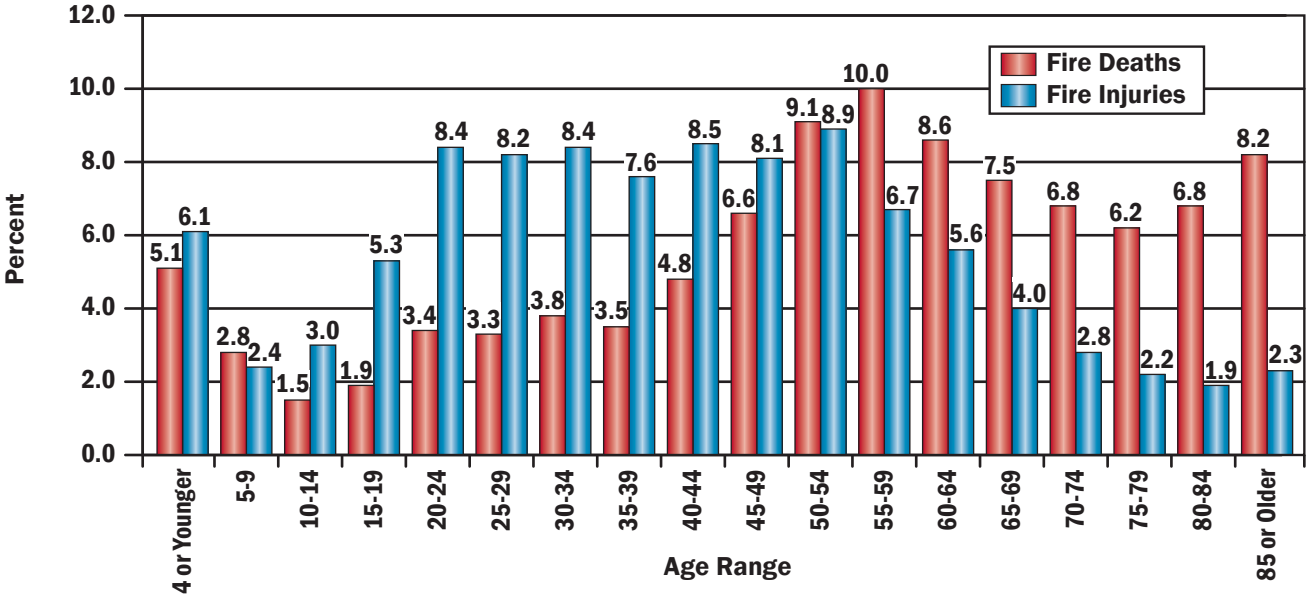
This topical report focuses on how fire risk, specifically the risk of death and injury, varies with age and how other demographic and socioeconomic factors weigh upon that risk.

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 adults age 50 or older all were at higher risk from dying in a fire than the general population. The very young (age 4 or younger) were also at higher risk of fire death and injury when compared to older children. Males, African-Americans, and American Indians/Alaska Natives also had a higher risk of death from fire than did the population as a whole. These groups still 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. For example, in the case of race, in 2011, the number of fire deaths was greatest for white Americans and least for American Indians/Alaska Natives. In the case of age, percentages of fire deaths were greatest for older middle-aged adults, and the very old, while 75 percent of fire injuries occurred among adults under age 55 (Figure 1).

Figure 1. Percentage of Fire Deaths and Injuries by Age, 2011



Sources: National Center for Health Statistics (NCHS), 2011 Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program and 2011 National Fire Incident Reporting System (NFIRS) 5.0 fire injury data.

Note: Data have been adjusted to account for deaths and injuries with unknown age. Age was not specified in less than 1 percent of fire deaths, and age was not specified in less than 1 percent of reported fire injuries. The total percentages for fire deaths and fire injuries do not add up to 100 percent due to rounding.

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. In the case of race, there are far fewer American Indians/Alaska Natives, for example, than white Americans living in the U.S. 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.[2] 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).

For the general population, the relative risk is set at 1. From this report, in 2011, the relative risk of dying in a fire for the total population of females in comparison to the total population was 0.8. This is equivalent to the per capita fire death rate for females (8.4 deaths per million population) divided by the per capita fire death rate for the entire population (11.0 deaths per million population[3]). Thus the relative risk of a female dying from fire was 20 percent less than that of the total population.

Data Sources and Methodology

The findings in this report pertaining to deaths were taken from the 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. For each reported death certificate in the U.S., NCHS assigned International Classification of Disease (ICD) codes for all reported conditions leading to death. For this report, the following ICD codes were analyzed: F63.1, W39-W40, X00-X09, X75-76, X96-97, Y25-26, and Y35.1.[4] These codes include all deaths in which exposure to fire, fire products or explosion was the underlying cause of death or 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 2011, which were released in June 2014 (release dates vary from year to year). For this reason, all analyses in this report reference 2011 data for reasons of consistency.

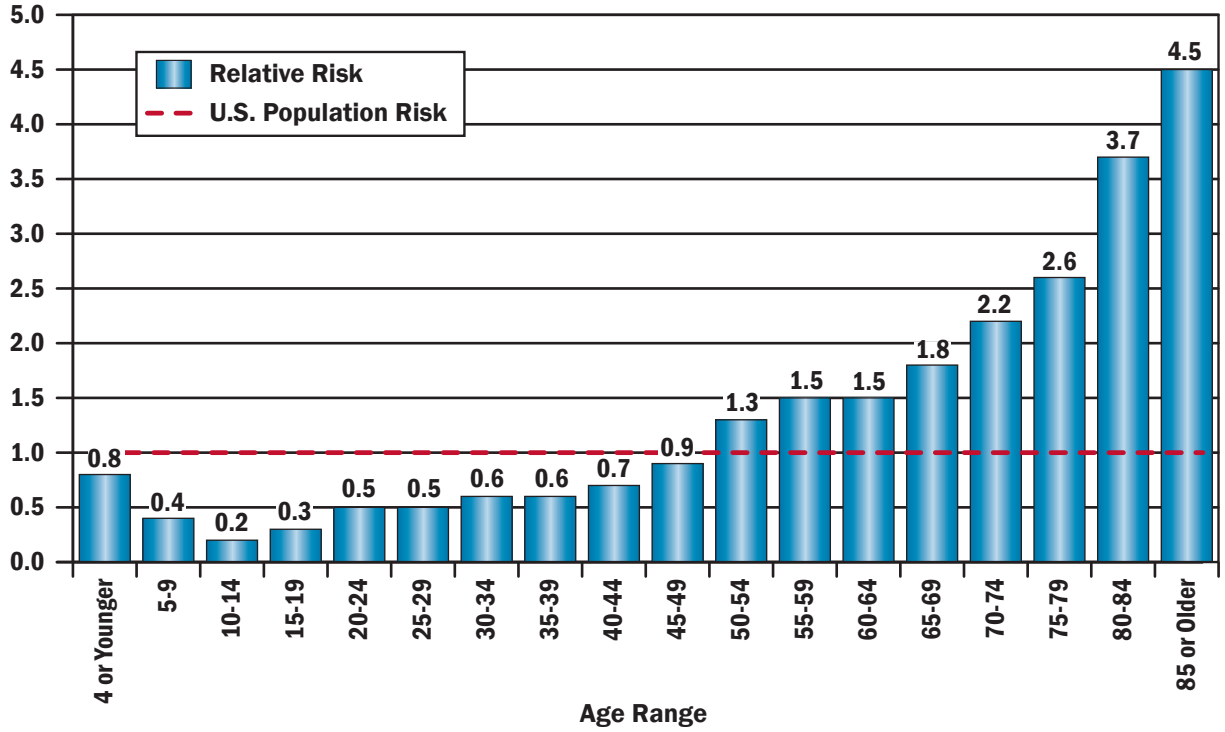
Fire injury estimates in this report are based on data from the 2011 NFIRS, Version 5.0 and the 2011 National Fire Protection Association (NFPA) survey.

Age and Risk of Fire Casualty

When physical and cognitive abilities are limited, as is often the case for the very old, the risk of death from fire rises. In 2011, older adults (age 65 or older) experienced large numbers of fire deaths that occurred in a small population

group. As a result, the risk of dying in a fire for these older adults was 2.7 times higher than for the population as a whole and rose even more for the oldest segment (Figure 2). For the youngest, children age 4 or younger, the risk of fire death was 20 percent less than that of the general population. But the risk of death for this age group was greater than for older children because as they matured and their cognitive and social abilities developed, the risk of fire death sharply dropped. After age 14, the risk of fire death began to steadily increase. By age 50, in 2011, the risk of fire death was above the risk for the general population, and it continued to increase as the population aged. 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 fire risk to children and older adults will be discussed in more detail in later sections of this report.

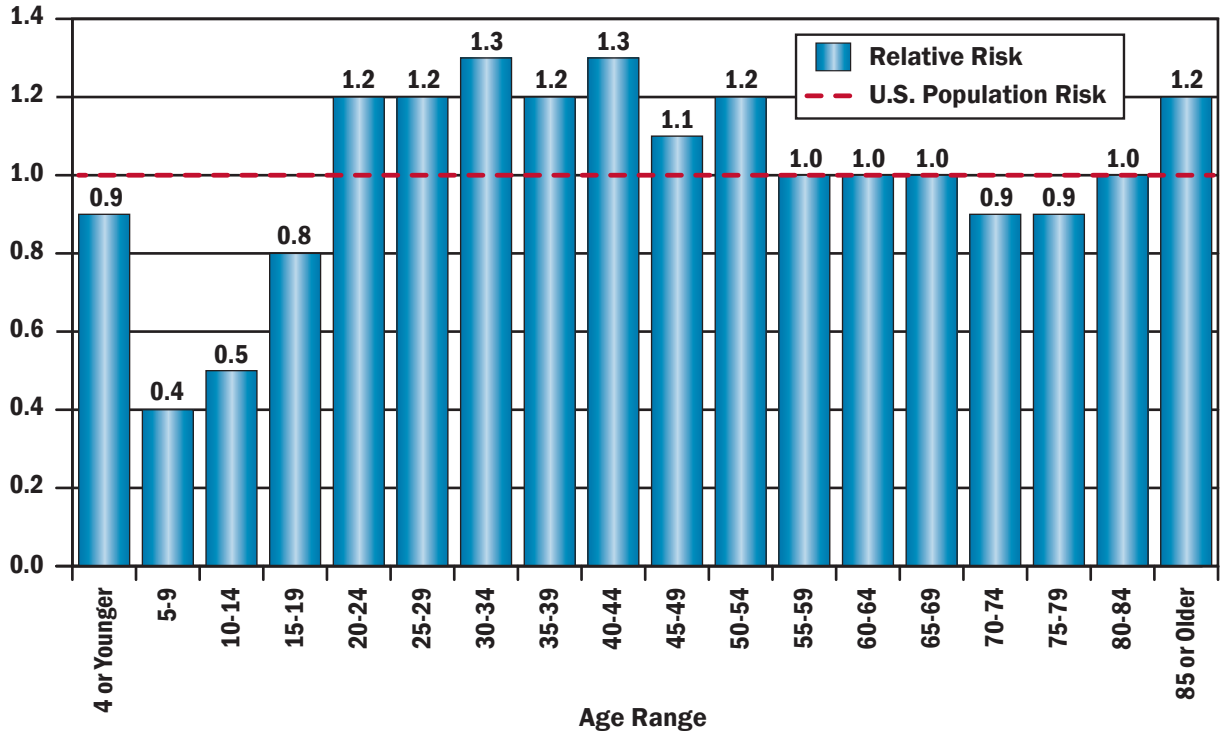
Figure 2. Relative Risk of Fire Death by Age, 2011



Sources: 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program and U.S. Census Bureau population estimates.
Note: Data have been adjusted to account for deaths with unknown age. Age was not specified in less than 1 percent of fire deaths.

The age profile of risk for fire injuries was very different from that for deaths (Figure 3), with a much narrower range of risk quotients (0.4 to 1.3 versus 0.2 to 4.5 for fire deaths).[5] This difference is thought to be the result of both cognitive and mobility issues that affect older adults. As a result, these adults were less likely to escape the effects of fire and thus suffer fatal injuries. Middle-aged individuals tended to suffer nonfatal injuries — in 2011, the relative risk of fire injury was greatest for the 20- to 54-year-olds, peaking for the 30- to 34-year-olds and the 40- to 44-year-olds (Figure 3). Adults age 85 or older, however, also had a greater risk of fire injury than the general population. The risk of injury was below average for children and adults younger than 20 and at or below average for adults between ages 55 to 84. In addition, while less than the total population, children age 4 and under had a greater relative risk of injury from fire than older children (age 5 to 14).

Figure 3. Relative Risk of Fire Injury by Age, 2011



Sources: 2011 NFIRS 5.0 fire injury data, 2011 NFPA fire injury estimates, and U.S. Census Bureau population estimates.
Note: Data have been adjusted to account for injuries with unknown age. Age was not specified in less than 1 percent of fire injuries.

Other Factors That Influence Risk

In the U.S. Fire Administration (USFA) report, "Socioeconomic Factors and the Incidence of Fire,"[6] 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 older adults live alone on meager incomes, often in substandard housing stock.[7] 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 have reduced employment opportunities. Further, research shows that fire death rates are higher in states with larger percentages of people who are African-American, poor and smokers; have less formal education; and live in rural areas. Many of these states tend to be in the southeastern U.S.[8]

Geographic location also has an effect. There was a greater risk of dying in a fire for people living in the South than for populations living in other regions (Table 1).[9] This, in part, may be 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 had a much lower risk of fire death. This reduction may be due, in part, to the role of heating (or lack thereof) in fire deaths, housing stock characteristics, and other factors.

Table 1. Relative Risk of Fire Death by Geographic Area, 2011

Region	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Northeast	55,598,499	542	9.7	0.9
Midwest	67,146,663	803	12.0	1.1
South	116,032,322	1,504	13.0	1.2
West	72,805,080	565	7.8	0.7
U.S. overall	311,582,564	3,414	11.0	1.0

Sources: 1. 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.
2. U.S. Census Bureau, Population Division. July 1, 2011 population estimates from Table 1. Annual Estimates of the Resident Population for the U.S., Regions, States and Puerto Rico: April 1, 2010 to July 1, 2013 (NST-EST2013-01), Release date: December 2013.
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 and race categories, males were more likely to die in a fire-related incident than females (Table 2, Table 4 and Table 6). Overall, in 2011, males were 1.5 times more likely to die in fires than females (Table 2). USFA data from NFIRS also showed that males, overall, were about 1.4 times more likely to suffer injuries than their female counterparts. 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,[10] which may be related to societal factors, cannot be ignored. African-Americans and American Indians/Alaska Natives had higher fire death rates per capita than the national average. African-Americans comprised a large and disproportionate share of total fire deaths, accounting for 19 percent of fire deaths in 2011 but only 14 percent of the U.S. population.[11] In 2011, African-Americans had a 50 percent greater risk of dying in a fire than the general population. While this risk is the same as it was in 2010, it was down from 80 percent more risk in 2007. For American Indians/Alaska Natives in 2011, the relative risk was also elevated; it was 20 percent higher than the risk of the general population, the same risk as in 2010, but down from 30 percent higher risk in 2007. By contrast, Asian/Pacific Islander Americans were much less likely than the overall population to die in a fire.

Table 2. Relative Risk of Fire Death by Race and Gender, 2011 Overall Population

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Total	311,582,564	3,414	11.0	1.0
Male	153,261,754	2,089	13.6	1.2
Female	158,320,810	1,325	8.4	0.8
White	243,336,096	2,653	10.9	1.0
African-American	40,770,877	649	15.9	1.5
American Indian/Alaska Native	3,803,632	48	12.6	1.2
Asian/Pacific Islander	16,399,712	64	3.9	0.4
White male	120,467,548	1,638	13.6	1.2
African-American male	19,469,076	379	19.5	1.8
American Indian/Alaska Native male	1,921,731	34	17.7	1.6
Asian/Pacific Islander male	7,830,552	38	4.9	0.4
White female	122,868,548	1,015	8.3	0.8
African-American female	21,301,801	270	12.7	1.2
American Indian/Alaska Native female	1,881,901	14	-	-
Asian/Pacific Islander female	8,569,160	26	3.0	0.3

Source: See notes at the end of the report.

Notes: 1. The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.3 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.

2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were less than 20 deaths per category.

Fire Risk to Children in 2011

While the relative risk of death or injury from fire for children under age 15 was lower than the general population, the very young will always remain inherently vulnerable for a variety of reasons. Escaping from a fire can be difficult for children. A child age 4 or under is usually too young to independently escape from a fire. Children of this age generally lack the mental faculties to understand the need and the means of quickly escaping from a burning structure. Even in their own homes, very young children lack an understanding of how to escape.

Physiologically, young children are susceptible to severe injury or death from fire. A young child's skin is quite thin and delicate compared to that of adults and older children. As a result, young children suffer burns more quickly and deeper than adults.[12, 13] In addition, smoke inhalation from

the toxic gases released by fires (and often in conjunction with burns suffered in the fires) accounted for 82 percent of all reported fire deaths in 2011. Young children (age 4 or younger) were also susceptible to this danger. Smoke inhalation accounted for 85 percent of fire deaths to children age 4 or younger.[14]

In addition to not recognizing the danger, young children are curious and will touch and manipulate most items left within their reach. This includes matches, cigarette lighters, candles, stoves and fireworks — all items that will readily harm a young child. One of the leading causes of reported residential building fire deaths and injuries for children age 9 or younger in 2011 was "playing with a heat source," which includes lighters and matches. Children age 9 or younger accounted for 80 percent of deaths and 31 percent of injuries where the cause of the residential building fire was due to "playing with a heat source" in 2011.[15]

The home can potentially be a high-risk environment for the occurrence of child fire injuries and deaths. The majority of casualties to children under the age of 15 — 81 percent of fatalities and 83 percent of injuries — occurred in residential buildings in 2011.[16] Inside of these residences, smoke alarms are credited with saving thousands of lives each year. Some studies, however, have questioned the efficacy of these alarms in alerting children. According to research conducted in Australia and Canada in the late 1990s, sleeping children do not respond appropriately to smoke alarms. A group of Australian researchers found that the risk factor changed when there was an adult around to wake the children, but many of the children remained groggy for some time and their responses were slowed.[17] Further studies have shown an increased response to alarms that use parental voices in lieu of the standard tone alarm.[18] While a limited number of voice-recordable alarms are available on the market, experts note that having a family fire and emergency exit plan is critical to saving lives in a fire.

In 2011, 325 children younger than 15 died as a result of fires (Table 3).[19] These children accounted for 9 percent of fire deaths. The youngest children were especially hard hit — 54 percent of child fire deaths affected children age 4 or younger. For children younger than 15 in 2011, exposure to smoke and fire was the second leading cause of nontransportation accidental deaths, after drowning.[20]

In addition, in 2011, fire injuries affected an estimated 2,000 children.[21] Again, the youngest suffered a large share of injuries — 53 percent of child fire injuries occurred to children age 4 or younger. As in previous years, fire deaths declined with increasing age. Fire injuries, however, declined between the young preschoolers (age 4 or younger) and the younger school-aged children (age 5 to 9) but rose for older children (age 10 to 14). With these three age groups combined, children accounted for 11 percent of all fire injuries.

Table 3. Child Fire Deaths and Injuries, 2011

	Overall (Ages 0 to 14)		Ages 0 to 4		Ages 5 to 9		Ages 10 to 14	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Deaths	324	100.0	175	54.0	97	29.9	52	16.0
Injuries	2,005	100.0	1,061	52.9	413	20.6	531	26.5

Sources: 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2011 NFIRS 5.0 fire injury data; and 2011 NFPA fire injury estimates.
Note: Total percent of child fire deaths does not add to 100 percent due to rounding.

In determining fire risk, age, gender and socioeconomic factors of children and the households where they live also come into play as they do for the total population. Because fire deaths decreased as the age of the child increased, the likelihood of dying in a fire also decreased (Table 4). In 2011, as previously discussed, children age 4 or younger had 20 percent less risk of dying in a fire than the general population. These children, however, had nearly twice the risk of dying in a fire as children between the ages of 5 and 9. Likewise, children of the 5 to 9 age group had nearly twice the risk of dying in a fire as children between the ages of 10 and 14. In fact, by the time a child reached the 10 to 14 age group, the risk of dying in a fire dropped to 29 percent of children age 4 and under.

Overall, boys tended to be at greater risk than girls. In addition, African-Americans comprised a large and disproportionate share of total fire deaths, accounting for 31 percent of fire deaths among children in 2011, but only 15 percent of the population. Moreover, African-American children age 4 or younger still had a relative risk of dying that was 1.7 times higher than the general population and 2.1 times higher than for all children in that age group.

Socioeconomic factors also have an effect on the fire risk to the youngest and most dependent children. The danger of death or injury is closely tied to household income. Children in the poorest homes are exposed to the greatest risk. A number of factors contribute to this elevated threat: The poor often live in substandard housing in crowded conditions, and children are more likely to be left alone than in affluent households, often because many of these children live in single-parent households where there are more children to supervise.[22]

Table 4. Relative Risk of Child Fire Deaths by Age, Race and Gender, 2011 Children (Ages 0 to 14)

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
All Children (Ages 0 to 14)				
Total	61,167,565	324	5.3	0.5
Male	31,253,961	194	6.2	0.6
Female	29,913,604	130	4.3	0.4
White	44,914,756	218	4.9	0.4
African-American	9,209,644	99	10.7	1.0
American Indian/Alaska Native	971,020	4	-	-
Asian/Pacific Islander	3,079,129	3	-	-

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Ages 0 to 4				
Total	20,122,198	175	8.7	0.8
Male	10,279,776	96	9.3	0.9
Female	9,842,422	79	8.0	0.7
White	14,562,216	113	7.8	0.7
African-American	3,056,316	57	18.6	1.7
American Indian/Alaska Native	327,226	4	-	-
Asian/Pacific Islander	1,026,485	1	-	-

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Ages 5 to 9				
Total	20,333,805	97	4.8	0.4
Male	10,384,298	61	5.9	0.5
Female	9,949,507	36	3.6	0.3
White	14,980,139	65	4.3	0.4
African-American	2,999,484	30	10.0	0.9
American Indian/Alaska Native	324,123	0	-	-
Asian/Pacific Islander	1,047,157	2	-	-

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Ages 10 to 14				
Total	20,711,562	52	2.5	0.2
Male	10,589,887	37	3.5	0.3
Female	10,121,675	15	-	-
White	15,372,401	40	2.6	0.2
African-American	3,153,844	12	-	-
American Indian/Alaska Native	319,671	0	-	-
Asian/Pacific Islander	1,005,487	0	-	-

Source: See notes at the end of the report.

Notes: 1. The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.3 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.

2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were less than 20 deaths per category.

Fire Risk to Older Adults in 2011

To be elderly is, in itself, a disadvantage in terms of fire risk. With advancing age, physical and mental capabilities decline, making it more difficult for older adults to clearly see, smell and hear. Lessened senses increase the risk of death or injury from fire. When two or more senses are diminished, the fire risk for an individual dramatically increases. To compound this problem, older adults are more inclined to accidentally start a fire than younger adults. Often older adults are close to the source of a fire — a cooking fire or a cigarette fire — and their clothes or bedding ignites. Because the aging process affects the senses, older adults typically have diminished sensation to pain, and thus they often do not seek timely treatment. All of these factors combine to increase the risk of death from fire for older adults.

Older people also tend to have physical disabilities or ailments that hinder their mobility. Many are wheelchair users. Such infirmities make it difficult for older adults to react to a fire threat the way a younger adult could, and thus they exacerbate the fire risk to this segment of the population. Alzheimer's, dementia and other disorders that affect mental functions (rational thought and actions) can increase the fire risk through erratic or even dangerous behavior and the inability to recognize a hazard.

Adults 65 years of age or older account for more than one-third of total outpatient spending on prescription medications in this country.[23] Moreover, 90 percent of older adults (65 or older) use at least one prescription drug, while 40 percent of older adults concurrently use five or more prescriptions.[24] Some medications cause drowsiness or affect judgment; others do not combine well with alcohol. This latter observation is important as alcohol use is prevalent among older adults. According to the National Survey on Drug Use and Health, 41 percent of adults 65 years or older reported current use of alcohol (at least one drink in the past 30 days) in 2012.[25] Further, 30 percent of those 75 years or older would consider themselves "current regular" drinkers, having had at least 12 drinks in the past year.[26] Alcohol alone can impair mental acuity, and older adults who combine medications and alcohol, or who abuse alcohol, face an even higher risk of starting a fire, not responding quickly enough to extinguish one, or not escaping the premises where a fire is in progress.

Older adults often elect to remain at home rather than confront long-term stays in health care facilities. Of home health care patients, 69 percent are over the age of 65.[27] Home health care for older adults is accompanied by an elevated fire risk. While no one factor is solely responsible for the increased fire risk to older adults receiving home health care, smoking in the presence of oxygen is recognized as one important problem.

In addition, as they age, Americans may be more likely to live in assisted living and nursing facilities than nursing homes. In 2010, 3.5 percent of people 65 years or older lived in nursing facilities,[28] and that number is likely to rise as people grow even older.

When poverty and infirmity accompany old age, the fire risk is compounded. Older adults often live on fixed incomes. Older adults who reside alone live in poverty more often than those who live with a spouse or other people. Many in this category are women who have outlived their husbands. In 2012, 9 percent of older adults lived below the poverty level.[29]

Housing for the poor is often substandard. Typically, such housing has not been well-maintained. Building structures can be compromised, and building systems, such as electrical and mechanical, are often outdated, inadequate or not operational. The result is a higher likelihood of damaged or fraying electrical wiring, faulty heating and worn-out household appliances. Heating in particular represents an elevated fire danger to older adults, who frequently feel cold. When the central heating source of a home does not work properly, older adults will often rely on temporary sources of heat, such as portable space heaters, fireplaces or even cooking ovens. This problem is especially severe in southern locales, which experience only intermittent demands for heating. Indeed, many residences in the South do not have central heating, and occupants are forced to rely solely on alternative heating.

Smoke alarms have saved many lives since the mid-1970s when their use was widely encouraged for the first time. The number of older adults living in housing without smoke alarms, or with alarms that do not work, is not well-documented. Nonetheless, even in homes with operable smoke alarms, older adults with impaired hearing are at an elevated risk of not responding in a timely manner.

In 2011, 1,215 older adults age 65 or older died as a result of fires (Table 5).[30] These adults accounted for 36 percent of all fire deaths; however, older adults comprised only 13 percent of the U.S. population in 2011,[31] and their ranks are growing. It is estimated that the older population will rise sharply between now and 2030, the years when the baby boom generation will be in retirement. By 2030, the U.S. Census Bureau estimates that adults age 65 or older will comprise 20 percent of the U.S. population, which will increase to 22 percent by 2060.[32] Better health care and new developments in medicine continue to increase American life expectancy. By their 65th birthday, on average, Americans can expect to live another 19 years.[33]

Adults ages 65 to 74 accounted for 40 percent of older adult fire deaths, and those ages 75 to 84 accounted for an additional 37 percent. Older adults age 85 or older accounted for the remaining 23 percent of older adult fire deaths.

While fire injuries affected an estimated 2,300 older adults, older adults accounted for 13 percent of all fire injuries, and the relative risk of older adults, age 65 or older, being injured in a fire was equal to that of the general population.[34] The youngest segment of the older adults suffered the largest share of injuries — 52 percent of older adult injuries occurred to those ages 65 to 74. The number of both fire deaths and fire injuries declined with increasing age.

Table 5. Older Adult Fire Deaths and Injuries, 2011

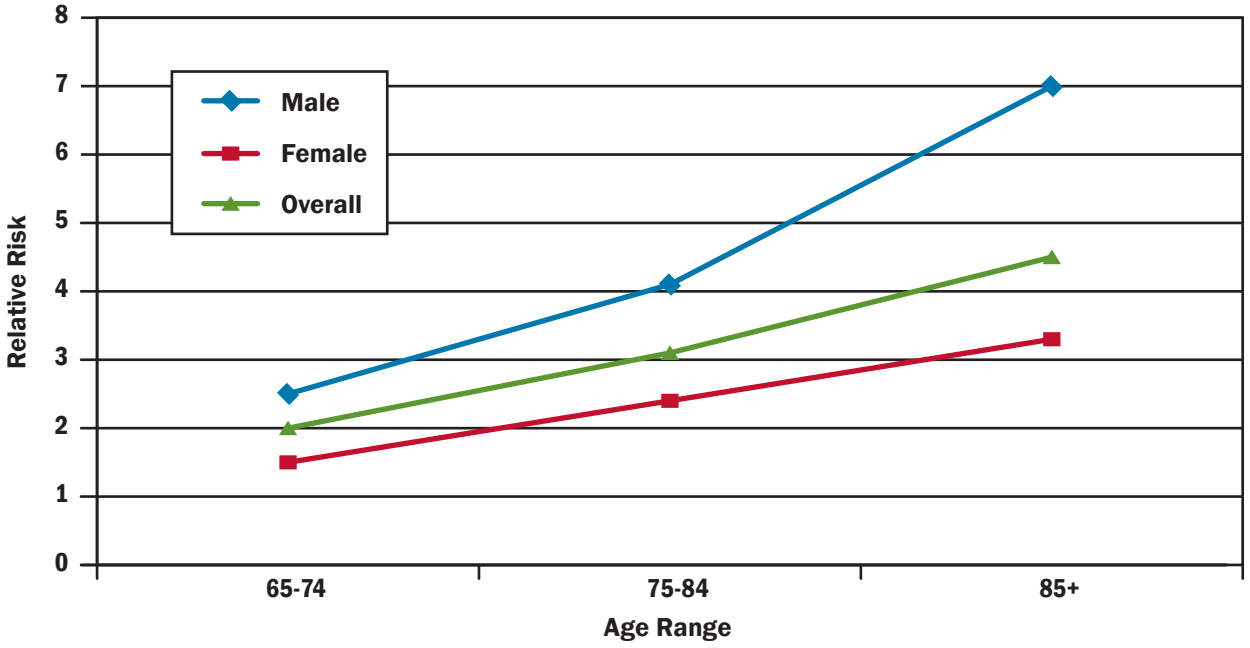
	Overall (Age 65 or Older)		Ages 65 to 74		Ages 75 to 84		Age 85 or Older	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Deaths	1,213	100.0	487	40.1	445	36.7	281	23.2
Injuries	2,290	100.0	1,184	51.7	710	31.0	396	17.3

Sources: 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2011 NFIRS 5.0 fire injury data; and 2011 NFPA fire injury estimates.

In 2011, the relative risk of dying for mature adults in a fire was 2.7 times higher than for the population as a whole (Table 6). This statistic alone is troublesome, but when subcategories of mature adults were more closely evaluated, the situation worsened. The relative risk of dying in a fire rose substantially for the oldest segment (Figure 4 and Table 6). Individuals age 85 or older were 4.5 times more likely to die in a fire than the general population, while those adults ages 65 to 74 were only 2.0 times more likely to suffer fire-related deaths.

As previously discussed, the risk of fire is not uniform across gender, and for the population as a whole, in 2011, males were 50 percent more likely than females to be victims of fires. This disparity held for older adults as well (67 percent), increasing to over 110 percent in the 85 or older age group.

Figure 4. Age, Gender and Relative Risk of Fire Fatality for Older Adults, 2011



Source: derived from Table 6.

In addition to gender, race also affects an older adult's fire risk. The problem is more severe for African-Americans. As a group, African-Americans had 1.5 times the relative risk of dying from fire than the general population (Table 2). But it was the African-American elderly, particularly those age 85 or over, who were most at risk — African-Americans age 85 and older had a fire death risk over 11 times greater than that of the general population and over two times the risk of all elderly people in this age group (Table 6).

Table 6. Relative Risk of Older Adult Fire Deaths by Age, Race and Gender, 2011 Older Adults (Age 65 and Older)

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
All Older Adults (Age 65 or Older)				
Total	41,369,513	1,213	29.3	2.7
Male	17,935,324	680	37.9	3.5
Female	23,434,189	533	22.7	2.1
White	35,629,934	974	27.3	2.5
African-American	3,618,979	196	54.2	4.9
American Indian/Alaska Native	247,809	12	-	-
Asian/Pacific Islander	1,561,285	31	19.9	1.8

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Ages 65 to 74				
Total	22,488,128	487	21.7	2.0
Male	10,478,646	287	27.4	2.5
Female	12,009,482	200	16.7	1.5
White	19,084,256	391	20.5	1.9
African-American	2,122,935	80	37.7	3.4
American Indian/Alaska Native	158,547	5	-	-
Asian/Pacific Islander	932,978	11	-	-

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Ages 75 to 84				
Total	13,168,568	445	33.8	3.1
Male	5,570,016	249	44.7	4.1
Female	7,598,552	196	25.8	2.4
White	11,454,201	363	31.7	2.9
African-American	1,088,138	65	59.7	5.5
American Indian/Alaska Native	68,477	4	-	-
Asian/Pacific Islander	467,775	13	-	-

Gender/Race	Population	Fire Deaths	Death Rate (per Million Population)	Relative Risk
Age 85 or Older				
Total	5,712,817	281	49.2	4.5
Male	1,886,662	144	76.3	7.0
Female	3,826,155	137	35.8	3.3
White	5,091,477	220	43.2	3.9
African-American	407,906	51	125.0	11.4
American Indian/Alaska Native	20,785	3	-	-
Asian/Pacific Islander	160,532	7	-	-

Source: See notes at the end of the report.

Notes: 1. The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.3 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.

2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were less than 20 deaths per category.

Conclusion

The very old are some of the nation's most vulnerable residents and, in 2011, their risk of death in a fire remained high. In addition, with an aging population, the U.S. demographic profile is rapidly changing. The older adult population (age 65 or older) is expected to increase from its current 13 percent of the total population to 22 percent by 2060,[35] with an assumed corresponding increase in fire deaths and injuries among older adults. According to U.S. Census Bureau projections, by 2060, the number of individuals age 65 or older is expected to be 92 million, more than double the amount in 2011. At the same time, the population age 85 or older is expected to more than triple, increasing from 5.7 million in 2011 to 18.2 million in 2060.[36] With advancing age, physical and mental capabilities of these older adults will likely decline, hindering their mobility and making it more difficult for them to clearly see, smell and hear. Lessened senses and decreased mobility increase the risk of death or injury from fire.

Improvements have been made in reducing fire deaths and injuries among children younger than 15 and, in 2011, their relative risk of death or injury was 50 percent lower than that of the general population. However, the youngest of children (age 4 and under) faced an elevated risk of injury or deaths in a fire when compared to older children. In addition, physiologically, young children are susceptible to severe injury or death from fire. For example, a young child's skin is quite thin compared to adults and older children. Children of this age also generally lack the mental faculties to understand the need and the means of quickly escaping from a burning structure. Further, while older children face a lower risk of death or injury in a fire and are more mobile than those in the youngest age group, they may still not have sufficient abilities to protect themselves. As a result, the young and old continue to merit special attention to reduce their risk of injury or death from fire.

Because children and older adults accounted for 45 percent of fire deaths and 25 percent of fire injuries in 2011 and for the reasons stated above, the USFA has been working toward the goal of reducing fire deaths and injuries to these populations. A number of resources to help address the fire problem for children and adults are available. For children, USFA provides outreach materials that provide parents with information on home strategies ranging from the control of matches and lighters to home escape planning to protect young children from fire (http://www.usfa.fema.gov/prevention/outreach/children.html). For adults, USFA provides outreach materials that address lifestyle strategies of safe smoking, safe cooking and safe heating to reduce the incidence of fires that traditionally affect older adults (http://www.usfa.fema.gov/prevention/outreach/older_adults.html). For further information, see the USFA website (http://www.usfa.fema.gov) or contact your local fire department.

In addition, technologies to detect and extinguish fires have been major contributors to the drop in overall fire fatalities and injuries over the past 35 years. Smoke alarms are now present in the majority of residential buildings. In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Nationally, only 3 percent of households lack smoke alarms.[37] Properly installed and maintained smoke alarms provide an early warning signal to household members in the event a fire occurs. Smoke alarms help save lives and property. The USFA continues to partner with other government agencies and fire service entities to improve and develop new smoke alarm technologies. More information on smoke alarm technologies, performance, disposal and storage, training bulletins, and public education and outreach materials can be found at http://www.usfa.fema.gov/prevention/technology/smoke_fire_alarms.html.

Residential sprinkler systems help to reduce the risk of civilian and firefighter casualties, homeowner insurance premiums, and uninsured property losses. Yet many residences are unequipped with automatic extinguishing systems that are often installed in hotels and businesses. Sprinklers are required by code in hotels and many multifamily residences. There are major movements in the U.S. fire service to require or facilitate use of sprinklers in all new homes, which could improve the use of residential sprinklers in the future. At present, however, they are largely absent in residences nationwide.[38] The USFA and fire service officials across the nation are working to promote and advance residential fire sprinklers. More information on costs and benefits, performance, training bulletins, and public education and outreach materials regarding residential sprinklers can be found at http://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. Additionally, USFA's position statement on residential sprinklers is available at http://www.usfa.fema.gov/about/sprinklers_position.html.

To request additional information or to comment on this report, visit http://www.usfa.fema.gov/contact.html.

Notes:

Sources for Table 2, Table 4 and Table 6 are the 2011 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, and U.S. population estimates from the U.S. Census Bureau, Population Division, http://www.census.gov/popest/data/index.html:

- Table 1. Annual Estimates of the Population for the U.S., Regions, States and Puerto Rico: April 1, 2010 to July 1, 2013 (NST-EST2013-01). Release date: December 2013.
- July 1, 2011 population estimates from the table, Annual Estimates of Resident Population by Sex, Age, Race, and Hispanic Origin for the United States and States: April 1, 2010 to July 1, 2013. Release date: June 2014.

[1] 2011 NCHS mortality data (deaths) and the 2011 NFPA survey estimates (injuries). The count of fire deaths cited in the text is rounded to the nearest five.

[2] 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 people. For example, in 2011, the per capita fire death rate for the total female population is computed from the total number of female fire deaths (1,325) divided by the total female population (158,320,810) multiplied by 1,000,000 people. This rate is equivalent to 8.4 fire deaths per 1 million population.

[3] In 2011, the per capita fire death rate for the total population is computed from the total number of fire deaths (3,414) divided by the total population (311,582,564) multiplied by 1,000,000 people. This rate is equivalent to 11.0 fire deaths per 1 million population.

[4] 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; and Y35.1 — Legal intervention involving explosives.

[5] Estimates of injuries by age are derived from 2011 NFIRS civilian fire casualty age data (Version 5.0) in conjunction with 2011 NFPA estimates of overall fire injuries.

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

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

[8] NFPA, Fire Analysis and Research Division, "Demographic and Other Characteristics Related to Fire Deaths or Injuries," March 2010, http://www.nfpa.org/~/media/Files/Research/NFPA%20reports/Victim%20Patterns/ ossocfactors.pdf (accessed Aug. 27, 2014).

[9] The regions of the U.S. are defined by the U.S. Census Bureau as the **Northeast** (Connecticut, Maine, Massachusetts, 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); and **West** (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming).

[10] As required by the Office of Management and Budget, starting in 1997, the U.S. Census Bureau generates population estimates for the following race categories: White, Black or African-American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, or Some Other Race (2+ race). "Hispanic or Latino" is considered an ethnicity and refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin **regardless** of race. As a result, "Hispanic or Latino" is not broken out as a separate race category in this report.

[11] Statistics are based on U.S. Census Bureau population estimates for July 1, 2011.

[12] New York State Department of Health, "Burn and Scald Prevention, Children Ages Five to Nine Years," https://www.health.ny.gov/prevention/injury_prevention/children/fact_sheets/older_children_5-9_years/burn_and_scald_prevention_5-9_years.htm (accessed Aug. 28, 2014).

[13] American Burn Association, Community Fire and Burn Prevention Programs, Scald Injury Prevention Campaign, "Scald Injury Prevention (Educator's Guide)," http://www.ameriburn.org/Preven/ScaldInjuryEducator'sGuide.pdf (accessed Aug. 28, 2014).

[14] NFIRS Version 5.0 data, 2011.

[15] NFIRS Version 5.0 data, 2011.

[16] NFIRS Version 5.0 data, 2011.

[17] Bruck, Dorothy, "Nonawakening in children in response to a smoke detector alarm," Fire Safety Journal, Vol. 32, Issue 4, June 1999, pp. 369-376.

[18] Smith, Gary, et al., "Comparison of a Personalized Parent Voice Smoke Alarm With a Conventional Residential Tone Smoke Alarm for Awakening Children," Pediatrics, Vol. 118, No. 4, October 2006, pp. 1623-1632, online at http://pediatrics.aappublications.org/content/118/4/1623.full (accessed Aug. 28, 2014).

[19] Numbers of fire deaths are extracted from 2011 NCHS mortality data using the ICD codes noted previously. The count of fire deaths cited in the text is rounded to the nearest five.

[20] NCHS, 2011 Multiple Cause of Death Data File which contains tables from the soon to be published "Deaths: Final Data for 2011" ("National Vital Statistics Reports," Vol. 63, No. 3), Table 10, http://www.cdc.gov/nchs/data/nvsr/nvsr63/nvsr63_03.pdf (accessed Aug. 28, 2014). This ranking excludes "other and unspecified nontransport" causes. As a group, "other and unspecified nontransport" causes are larger than the leading specified nontransport causes.

[21] Estimates of fire injuries are calculated by determining the percent of injuries reported to NFIRS and applying the percentage to the NFPA estimate of fire injuries. The fire injury estimate cited in the text is rounded to the nearest 25.

[22] USFA, "Socioeconomic Factors and the Incidence of Fire," FA-170, June 1997.

[23] U.S. Department of Health and Human Services (DHHS), National Institutes of Health, National Institute on Drug Abuse, "Research Report Series — Prescription Drugs: Abuse and Addiction," October 2011, page 8, http://www.drugabuse.gov/sites/default/files/rrprescription.pdf (accessed Sept. 9, 2014).

[24] NCHS, "Health, United States 2013," Table 92. Prescription drug use in the past 30 days, by sex, age, race and Hispanic origin: United States, selected years 1988-1994 through 2007-2010, http://www.cdc.gov/nchs/data/hus/hus13.pdf (accessed Sept. 9, 2014).

[25] DHHS, Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings, Section 3.1, http://www.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.htm#ch3.1.1 (accessed Sept. 9, 2014).

[26] Centers for Disease Control and Prevention, DHHS, Vital and Health Statistics, Series 10, Number 260, February 2014, "Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2012," Table 25, http://www.cdc.gov/nchs/data/series/sr_10/sr10_260.pdf (accessed Sept. 9, 2014).

[27] NCHS, National Health Statistics Reports, Number 38, "Home Health Care and Discharged Hospice Care Patients: United States, 2000 and 2007," April 27, 2011, http://www.cdc.gov/nchs/data/nhsr/nhsr038.pdf (accessed Sept. 9, 2014).

[28] Wendy Fox-Grage, Ari Houser, and Kathleen Ujvari, "Across the States: Profiles of Long Term Services and Supports, Ninth Edition, 2012, Page 40," American Association for Retired Persons, http://www.aarp.org/home-garden/livable-communities/info-09-2012/across-the-states-2012-profiles-of-long-term-services-supports-AARP-ppi-ltc.html (accessed Sept. 9, 2014).

[29] U.S. Census Bureau, "Income, Poverty, and Health Insurance Coverage in the United States: 2012, Current Population Reports, P60-245," "Table 3. People in Poverty by Selected Characteristics: 2011 and 2012" based on "Current Population Survey," September 2013, http://www.census.gov/prod/2013pubs/p60-245.pdf (accessed Sept. 9, 2014).

[30] 2011 NCHS mortality data. The count of fire deaths cited in the text is rounded to the nearest five.

[31] U.S. Census Bureau, Population Division, July 1, 2011 population estimates from the table, Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the United States and States: April 1, 2010 to July 1, 2013. Release date: June 2014, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk (accessed Sept. 9, 2014).

[32] U.S. Census Bureau, Population Division, Table 3. Percent Distribution of the Projected Population by Selected Age Groups and Sex for the United States: 2015 to 2060 (NP2012-T3). Release date: December 2012, http://www.census.gov/population/projections/data/national/2012/summarytables.html (accessed Aug. 27, 2014).

[33] NCHS, "Health, United States 2013," Table 18. Life expectancy at birth, at age 65, and at age 75, by sex, race, and Hispanic origin: United States, selected years 1900-2010, http://www.cdc.gov/nchs/data/hus/hus13.pdf (accessed Sept. 9, 2014).

[34] Estimates of fire injuries are calculated by determining the percent of injuries reported to NFIRS and applying this percentage to the NFPA estimate of fire injuries. The fire injury estimate cited in the text is rounded to the nearest 25.

[35] U.S. Census Bureau, Population Division, Table 3. Percent Distribution of the Projected Population by Selected Age Groups and Sex for the United States: 2015 to 2060 (NP2012-T3). Release date: December 2012, http://www.census.gov/population/projections/data/national/2012/summarytables.html (accessed Aug. 27, 2014).

[36] U.S. Census Bureau, Population Division, Table 12. Projections of the Population by Age and Sex for the United States: 2015 to 2060 (NP2012-T12). Release date: December 2012, http://www.census.gov/population/projections/data/national/2012/summarytables.html (accessed Aug. 27, 2014).

[37] Greene, Michael and Craig Andres, "2004-2005 National Sample Survey of Unreported Residential Fires," Division of Hazard Analysis, Directorate for Epidemiology, U.S. Consumer Product Safety Commission, July 2009.

[38] Department of Housing and Urban Development (HUD) and U.S. Census Bureau, 2011 American Housing Survey, "Health and Safety Characteristics-All Occupied Units (National)," Table S-01-AO, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2011_S01AO&prodType=table.