

Fire Risk to Children 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

- The relative risk of children under age 15 dying in a fire is slightly lower than that for the general population. However, when dividing the young into subgroups, 50% of all child fire deaths occur to those under age 5. These children usually are unable to escape from a fire independently.
- The number of fire injuries also are highest in the under-age-5 bracket, decline in the middle years, but rise again in the 10 to 14 age group. This is a different pattern than deaths, which decrease as children age.
- Boys are at slightly higher risk of death from fire than girls.
- African-American and American Indian/Alaska Native children are at an increased risk of death from fire.

It is an unfortunate fact that young children face an elevated risk of injury or death in a fire. Very young children typically are dependent to some degree on others for their safety. Older children are more mobile, but may not have sufficient abilities to protect themselves. Although many factors influence the risk children face, more often than not age—and more specifically immaturity—dominates. This Topical Fire Report provides a brief analysis of the fire risk for children between birth and age 14. It is an update to *The Fire Risk to Children*, Volume 4, Issue 8.

The concept of “risk” with respect to fire casualties can be addressed in several ways: absolute numbers of deaths and injuries, proportions (percent) of these casualties, rates (per unit, usually fires or population), and relative risk. Each measure is useful but in different ways, and each has its drawbacks. The absolute number of casualties is an important consideration—it is a concrete measure of the size or magnitude of the problem, but does not address the magnitude relative to other aspects of the problem. In this case, proportions are used to compare the relative size of the problem. Yet, these proportions do not convey the magnitude of the problem as does the absolute number of casualties. Neither of

these two measures is useful for comparisons across different groups. For comparison across groups, a common basis is used to determine rates. These rates then account for any differences in group sizes that might affect the magnitude of the problem.¹

In comparing fire rates, the relative risk of dying or being injured is a helpful measure. The relative risk of a group is calculated by comparing its rate to the rate of the overall population. The result is a measure of how likely a particular group is to be affected. A detailed discussion of per capita rates and relative risk can be found in the Topical Fire Series report, *Fire Risk in 2004* (Volume 7, Issue 5, February 2008). When evaluated in the aggregate, children have a relative risk of fire death similar to that of the general population. For 2004, however, this relative risk is lower than the general population. But grouping all children together from birth to age 14 can be misleading. The deaths and injuries are substantially higher for the youngest population, those children aged 4 and under. In this topical report, children are divided into age subgroups to better understand how risk varies as children grow older. The groupings are age 4 and under, aged 5 to 9, and aged 10 to 14.

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Who Is Affected

In 2004, nearly 560 children under the age of 15 died as a result of fires (Table 1).² Children aged 14 and under accounted for 14% to 17% of fire deaths, depending on the data source.³ The youngest children were especially hard

hit—50% of child fire deaths affected children under the age of 5. For children under age 15 in 2004, deaths from fire and burns were the second leading cause of nontransportation accidental deaths.⁴

Table 1. Child Fire Deaths and Injuries, 2004.

| | Overall (Aged Birth to 14) | | Aged Birth to 4 | | Aged 5 to 9 | | Aged 10 to 14 | |
|-----------------|-------------------------------|---------|-----------------|---------|-------------|---------|---------------|---------|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Deaths | 558 | 100.0 | 279 | 50.0 | 182 | 32.6 | 97 | 17.4 |
| Injuries | 2,007 | 100.0 | 875 | 43.6 | 424 | 21.1 | 707 | 35.3 |

Source: National Center for Health Statistics (NCHS), 2004 (deaths); 2004 National Fire Incident Reporting System (NFIRS) 5.0 and 2004 National Fire Protection Association (NFPA) (injuries).

Fire injuries affected an estimated 2,000 children in 2004. Again, the youngest suffered a large share of injuries—44% of child fire injuries occurred to children under age 5 (Table 1). As in previous years, fire deaths declined with increasing age. Fire injuries, however, declined among the young preschoolers and the younger school-aged children (aged 5 to 9) but rose for older children. With age groups combined, children accounted for 11% of all fire injuries.

Age, demographics (e.g., gender), and socioeconomic factors of children and the households where they live all come into play in determining fire risk. Because fire deaths decrease as the age of the child increases, the likelihood of dying in a fire also decreases (Table 2). Children under age 5 have approximately the same risk of dying in a fire as the general population. By the time a child reaches the 10 to 14 age group, his/her risk of dying in a fire drops to 30% that of his/her youngest counterparts. Boys tend to be at greater risk than girls, with the most marked difference in the 5 to 9 age group. African-American children are at greater risk than the national average—African-Americans comprise a large and disproportionate share of total fire deaths, accounting for 38% of fire deaths among children in 2004. Improved from previous years, African-American children aged 4 and below still had a relative risk of dying that was 2.4 times higher than both the general population and for all children in that age group. For children of American Indians/Alaska Natives in 2004, the relative risk also was above the general population

(1.4), and in children 4 and under, the risk rose to 2.5. The absolute numbers of deaths here are quite low, but the population base is also very small.

Why Children Are At Risk

Escaping from a fire can be difficult for children. A child aged 4 or under is usually too young to escape from a fire independently. Children of this age generally lack the mental faculties to understand the need and the means of quickly escaping a burning structure. As shown in Table 1, half of child fire fatalities and 44% of child fire injuries were among preschoolers. 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 compared to adults and older children. As a result, young children can suffer deep burns more rapidly.⁵ Exposure to toxic byproducts of fire is especially serious to children—48% of fatalities in children under age 15 were the result of asphyxiation, as compared to 31% of older fatalities, aged 15 and above.

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.

Table 2. Relative Risk of Child Fire Deaths by Age, Race, and Gender, 2004.

| Gender/Race | Population | Fire Deaths | Death Rate per Million Population | Relative Risk |
|--|------------|-------------|--------------------------------------|---------------|
| All Children (Aged Birth to 14) | | | | |
| 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 |
| Aged Birth to 4 | | | | |
| Total | 20,069,872 | 279 | 13.9 | 1.0 |
| Male | 10,263,864 | 148 | 14.4 | 1.1 |
| Female | 9,806,008 | 131 | 13.4 | 1.0 |
| White | 15,338,079 | 169 | 11.0 | 0.8 |
| African-American | 3,020,864 | 98 | 32.4 | 2.4 |
| American Indian/ Alaska Native | 203,121 | 7 | 34.5 | 2.5 |
| Asian/Pacific | 866,510 | 5 | 5.8 | 0.4 |
| White Male | 7,856,780 | 92 | 11.7 | 0.9 |
| African-American Male | 1,532,399 | 50 | 32.6 | 2.4 |
| American Indian/ Alaska Native Male | 103,186 | 5 | 48.5 | 3.6 |
| Asian/Pacific Male | 444,641 | 1 | 2.2 | 0.2 |
| White Female | 7,481,299 | 77 | 10.3 | 0.8 |
| African-American Female | 1,488,465 | 48 | 32.2 | 2.4 |

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| Gender/Race | Population | Fire Deaths | Death Rate per Million Population | Relative Risk |
|--|------------|-------------|--------------------------------------|---------------|
| American Indian/ Alaska Native Female | 99,935 | 2 | 20.0 | 1.5 |
| Asian/Pacific Female | 421,869 | 4 | 9.5 | 0.7 |
| Aged 5 to 9 | | | | |
| Total | 19,623,955 | 182 | 9.3 | 0.7 |
| Male | 10,038,541 | 117 | 11.7 | 0.9 |
| Female | 9,585,414 | 65 | 6.8 | 0.5 |
| White | 14,986,558 | 93 | 6.2 | 0.5 |
| African-American | 2,980,704 | 77 | 25.8 | 1.9 |
| American Indian/ Alaska Native | 236,610 | 5 | 21.1 | 1.6 |
| Asian/Pacific | 819,605 | 7 | 8.5 | 0.6 |
| White Male | 7,688,809 | 58 | 7.5 | 0.6 |
| African-American Male | 1,513,347 | 52 | 34.4 | 2.5 |
| American Indian/ Alaska Native Male | 120,580 | 3 | 24.9 | 1.8 |
| Asian/Pacific Male | 410,922 | 4 | 9.7 | 0.7 |
| White Female | 7,297,749 | 35 | 4.8 | 0.4 |
| African-American Female | 1,467,357 | 25 | 17.0 | 1.3 |
| American Indian/ Alaska Native Female | 116,030 | 2 | 17.2 | 1.3 |
| Asian/Pacific Female | 408,683 | 3 | 7.3 | 0.5 |
| Aged 10 to 14 | | | | |
| Total | 21,142,674 | 97 | 4.6 | 0.3 |
| Male | 10,829,786 | 49 | 4.5 | 0.3 |
| Female | 10,312,888 | 48 | 4.7 | 0.3 |
| White | 16,122,286 | 55 | 3.4 | 0.3 |
| African-American | 3,405,544 | 37 | 10.9 | 0.8 |
| American Indian/ Alaska Native | 266,793 | 1 | 3.7 | 0.3 |
| Asian/Pacific | 829,261 | 4 | 4.8 | 0.4 |
| White Male | 8,276,942 | 32 | 3.9 | 0.3 |
| African-American Male | 1,728,460 | 15 | 8.7 | 0.6 |
| American Indian/ Alaska Native Male | 135,067 | 1 | 7.4 | 0.5 |
| Asian/Pacific Male | 426,666 | 1 | 2.3 | 0.2 |

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| Gender/Race | Population | Fire Deaths | Death Rate per Million Population | Relative Risk |
|--|------------|-------------|-----------------------------------|---------------|
| White Female | 7,845,344 | 23 | 2.9 | 0.2 |
| African-American Female | 1,677,084 | 22 | 13.1 | 1.0 |
| American Indian/ Alaska Native Female | 131,726 | 0 | 0.0 | 0.0 |
| Asian/Pacific Female | 402,595 | 3 | 7.5 | 0.5 |

Source: National Center for Health Statistics, 2004 Mortality Data; and U.S. population estimates from the 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);

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).

Note: Relative risk may not compute due to rounding.

The home is a dangerous place for young children: the majority of casualties to children under the age of 15—approximately 91% of fatalities and 87% of injuries—occurred in residential properties in 2004.⁶

Socioeconomic factors 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, children are more likely to be left alone than in affluent households, many of these children live in single-parent households, and there are more children to supervise.⁷

Efforts to Combat Risk

To help combat fire injuries in children, the U.S. Consumer Product Safety Commission (CPSC) set a mandatory safety standard that requires disposable lighters and certain novelty lighters to be child-resistant. These standards, set in 1994, cover more than 95% of the 600 million lighters purchased in the United States each year.⁸ A study by the Directorate for Epidemiology of the CPSC found a 58% reduction in cigarette lighter fires caused by children, resulting in the prevention of 3,300 fires, 100 deaths, 660 injuries, and \$52.5 million in property losses in 1998 alone.⁹

FBI statistics have suggested that children account for approximately half of all arrests for arson, and more than

one-third were 12 or younger.¹⁰ The reasons for juvenile firesetting are various, and the research in this area is expanding our understanding of the problem. Nonetheless, young children appear to start fires as part of play in a relatively normal phase of development. Older juvenile firesetters often have psychological problems that may relate to emotional disturbance, juvenile delinquency, and other issues.^{11,12} Across the country, fire departments sponsor programs to identify juvenile firesetters, help provide the necessary intervention, and promote youth fire safety.

Smoke alarms are unanimously credited with saving thousands of lives each year. Dramatic gains in injury prevention and survival rates have been seen since the devices came onto the market in the 1970s. Newer 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 the alarm. Psychologist Dorothy Bruck, Victoria University, Australia, and her associates 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.¹³ Further studies have shown an increased response to alarms that use parental voices in lieu of the standard tone alarm.¹⁴ While a limited number of voice-recordable alarms are available on the market, experts note that having a family fire and emergency exit plan are critical to saving lives in a fire.

Conclusion

Children are some of the Nation's most vulnerable residents and merit special attention to reduce their risk of injury or death from fire. Gains have been made in reducing fire deaths and injuries among children. CPSC continues to look at products that pose additional fire risks for children. Many education programs are available to teach young children and their caregivers about the dangers associated with fire, yet young children continue to die from fire-related injuries each year.

Appropriate oversight of small children is one of the most effective means of preventing injury or death from all sources. A greater understanding of why children are at an

elevated risk of death and injury from fire still is required. So, too, are strategies to lower that risk. A number of resources are available to help address the fire problem for children. Because children account for 14% to 17% of fire deaths and 11% of fire injuries, the U.S. Fire Administration (USFA) has been working toward the goal of reducing fire deaths and injuries to children. 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.

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

References:

¹ In the case of fire casualties, this common basis is a population of 1 million, which means that fire rates are measured by incidents, deaths, or injuries per million persons.

² Fire deaths are extracted from the 2004 National Center for Health Statistics (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.

³ National Fire Incident Reporting System (NFIRS) version 5.0 data for 2004 indicates 17% of fire deaths occurred in the 14 and under age group; data extracted from NCHS indicate these deaths are 14% of all fire deaths for 2004.

⁴ NCHS, "Deaths: Final Data for 2004." *National Vital Statistics Reports*, Vol. 55, No. 19, August 21, 2007, revised October 10, 2007. This ranking excludes "other and unspecified nontransport" causes. As a group, "other and unspecified nontransport" causes are larger than the leading specified nontransport causes.

⁵ Fire Smart, <http://www.nfpa.org/RiskWatch/topfireburn.html>

⁶ NFIRS version 5.0 data, 2004.

⁷ *Socioeconomic Factors and the Incidence of Fire*. U.S. Fire Administration (USFA), FA 170, June 1997.

⁸ "Child-Resistant Lighters Protect Young Children." CPSC Document #5021, <http://www.cpsc.gov/CPSC/PUBS/PUBS/5021.html>

⁹ "Study of the effectiveness of the US safety standard for child resistant cigarette lighters." *Injury Prevention* 2002:8: 192-196. <http://www.cpsc.gov/LIBRARY/FOIA/FOIA03/os/lighters.pdf>

¹⁰ Office of Juvenile Justice and Delinquency Prevention Fact Sheet. "Juvenile Arson, 1997." Office of Juvenile Justice and Delinquency Prevention, U.S. Department of Justice, February 1999. <http://www.ncjrs.gov/pdffiles1/fs9991.pdf>

¹¹ Juvenile Justice Bulletin "Juvenile Firesetting: A Research Overview." U.S. Department of Justice, Office of Justice Programs, Office of Juvenile Justice and Delinquency Prevention, May 2005. <http://www.ncjrs.gov/pdffiles1/ojjdp/207606.pdf>

¹² *Intentional Fires and Arson*. NFPA, November 2007.

¹³ Dorothy Bruck. "Non-awakening in children in response to a smoke detector alarm." *Fire Safety Journal*, Vol. 32, Issue 4, June 1999, pp. 369-376.

¹⁴ 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/cgi/content/full/118/4/1623>