



RESEARCH



# US Fire Death Rates by State

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## Key Findings

Fire death rates vary considerably by state, with 2013–2017 average deaths rates per million population ranging from a low of 4.6 to a high of 23.5. The US average was 9.9.

Nine of the 10 states with the highest overall fire death rates in 2013–2017 were in the South.

Higher state fire death rates are correlated with larger percentages of people who

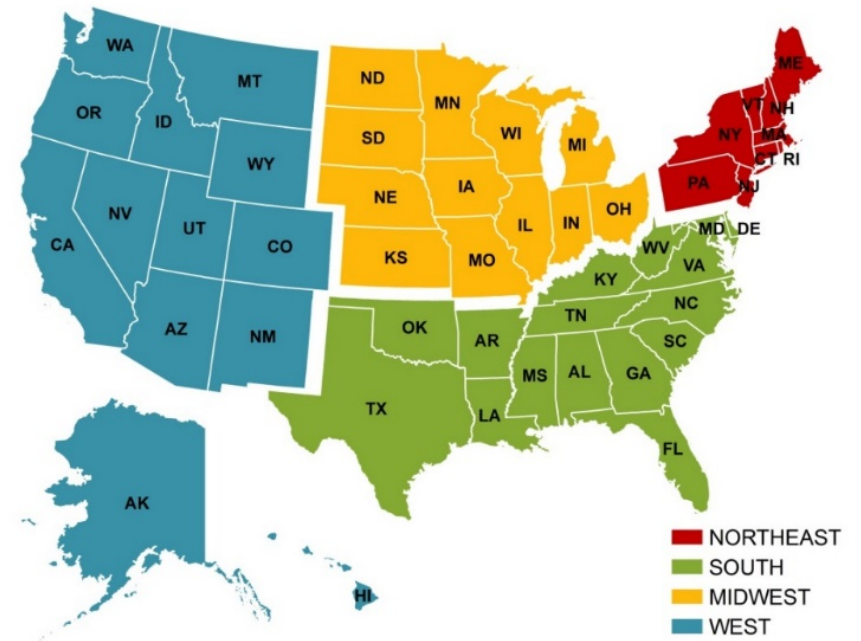
- Have a disability;
- Have incomes below the poverty line;
- Are current smokers;
- Live in rural areas; and
- Are either African American or Black, or are Native American or Alaskan Native.

None of these factors themselves causes fires or fire deaths.

## Trends

All but three states had fewer fire deaths in 2013–2017 than in 1981–1985. All states had lower fire death rates in 2013–2017 than in 1981–1985.

Figure 1. US Census Regions



## Introduction

Fire death rates vary considerably by state. Information about demographic factors associated with higher fire death rates and about how individual states compare with others is helpful in developing appropriate prevention programs. Risk factors should be considered when developing these programs and materials. Users can also compare the progress made in reducing deaths and death rates with the country as a whole.

This analysis uses death certificate data collected by the National Center for Health Statistics (NCHS) (accessible at the Centers for Disease Control and Prevention's [CDC's] [Web-based Injury Statistics Query and Reporting System \(WISQARS™\) Fatal Injury Reports](#)) to provide total and home average fire or flame deaths and average fire or flame death rates per year for 1981–1985 through 2013–2017. Additional information was obtained from the Underlying Cause of Death query page at [Wonder.cdc.gov](#). Unless otherwise specified, demographic data were obtained from the American Community Survey, US Census Bureau, and the Behavioral Risk Factor Surveillance System. See Appendix A for more details. Information from the literature provides further context.

## State level trends

An average of 3,170 US death certificates per year in 2013–2017 indicated that a fire or flame was an external cause of injury. Nearly every state had fewer fire deaths and a lower fire death rate in 2013–2017 than in 1981–1985. Only three states, Arizona, Nevada, and New Mexico, had an increase in fire deaths over that interval. The fire death rate per million population was lower in 2013–2017 than in 1981–1985 in all 50 states.

Death certificate data showed a 2 percent increase in the fire death toll nationally from the 2008–2012 period to 2013–2017. Thirty-four states showed an increase in fire deaths over these two recent

periods; 30 states experienced an increase in the fire death *rate* per million population. Some fluctuation is normal, particularly in states with smaller populations.

Nine of the ten states with the highest overall fire death rates in 2013–2017 were in the South. Alaska was the exception.

## Race and ethnicity

Figure 2 shows the average deaths per year in the US by race or ethnicity. Five of the 10 states with the highest death rates were also among the 10 states with the highest percentage of African American or Black residents. Two of the other states with the highest fire death rates were in the top 10 states with the highest percentage of Native American or Alaska Native residents.

**Figure 2. US Fire deaths by race or ethnicity  
2013-2017 annual averages**

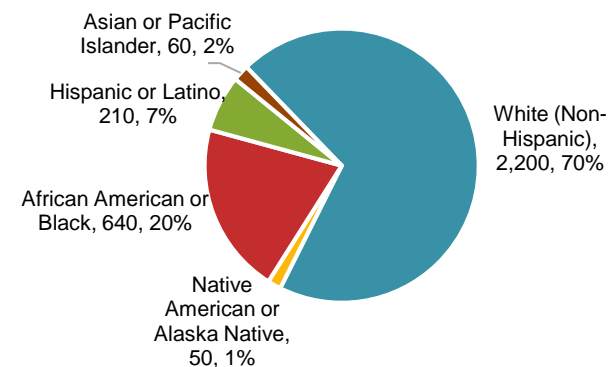


Figure 3 shows that Native Americans or Alaska Natives have the highest fire death rate, followed by African Americans. In their 2010 article, Bishai and Lee noted that in 1999–2004, African Americans

and Native Americans aged 55 and older had much higher fire death rates than White people of comparable age.<sup>1</sup>

In 2013–2017, fire death rates were notably higher for African American and Native Americans of all ages. While death rates increase with advanced age in all races and ethnicities, Figure 3 shows exceptionally high death rates for African Americans and Native Americans who were at least 75 years of age.

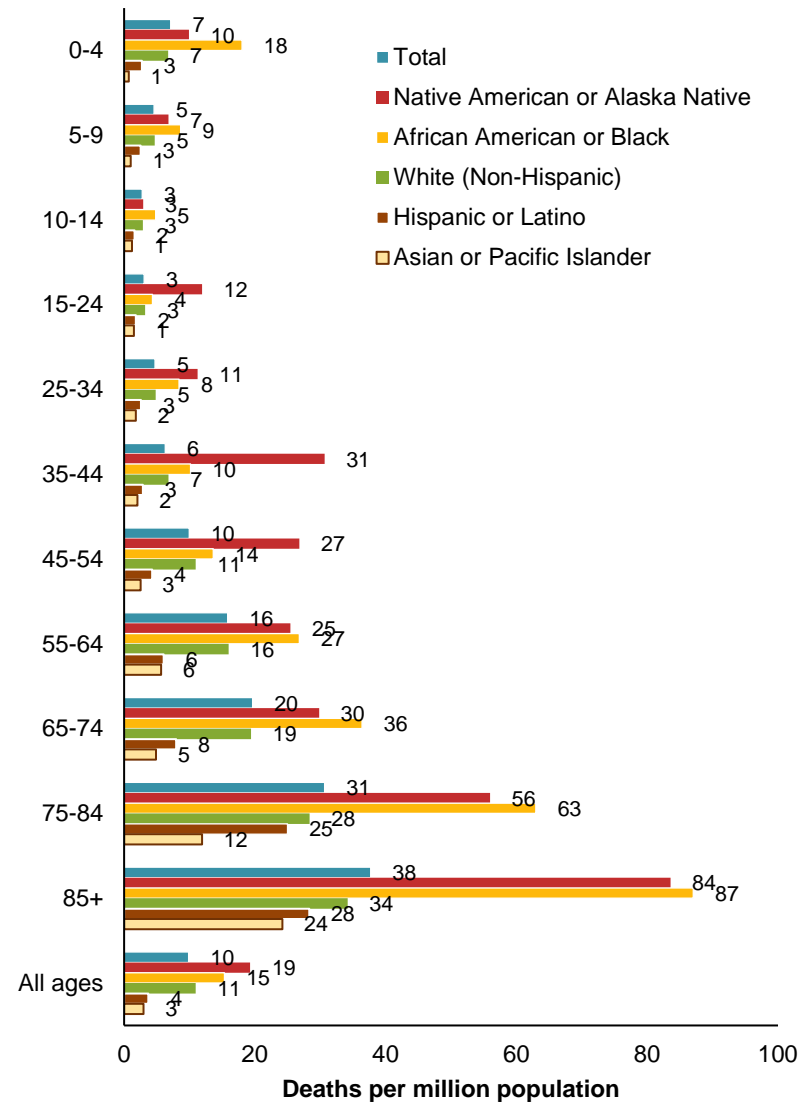
In their 2016 article, Karb, Subramanian, and Fleeger compared county fire death rates in 1999 and 2012 by age, gender, race or ethnicity, urban/rural continuum, and county poverty percentages for all unintentional injuries and for six specific causes, including fire or smoke exposure.<sup>2</sup> As in this analysis, fire and smoke death rates were uniformly lower in 2012 than in 1999 across the different measures. The fire death rate increased with age, was higher for individuals who were Black or African American, and was lowest for Hispanics. (Native Americans and Asian Americans were grouped together as “other.”)

### Poverty

Race and ethnicity are correlates of other factors that may have a greater impact on risk. According to Census data, 12.3 percent of the US population lived in households with incomes below the poverty line in 2017. This was true for 21.2 percent of the African American or Black population, 18.3 percent of the Hispanic population, 10 percent of the Asian population, and only 8.7 percent of the White, non-Hispanic population.<sup>3</sup>

In this analysis, six of the 10 states with the highest fire death rates were among the 10 states with the largest percentage of the population below the poverty line.

**Figure 3. Fire death rates by age and race or ethnicity: 2013-2017**



People who are poor generally have older things, often find it difficult to afford repairs or routine maintenance, may work multiple jobs to make ends meet, and are likely to face more stress. They may have less energy and resources to focus on safety. In their analysis of 1988–1992 fire death rates from counties with populations of 250,000 or more, Hannon and Shai found that “...areas with a high proportion of African Americans and a low median family income tend to have exceptionally high fire death rates, and racial composition appears unrelated to variation in the fire death rate among areas with very high levels of income.”<sup>4</sup>

Karb, Subramanian, and Fleegeer found that fire death rates increased steadily with increasing percentages of county population with incomes below the poverty line. In 2012, the 12.4 fire deaths per million population in counties in which at least 20 percent of the population had incomes below the poverty line was nearly five times the 2.6 deaths per million population in counties with less than 5 percent of the population below the poverty line. Individuals living in a county with a high poverty rate may or may not be poor. The authors noted that area poverty, such as inadequate infrastructure and local services, can be an issue for all residents.<sup>5</sup>

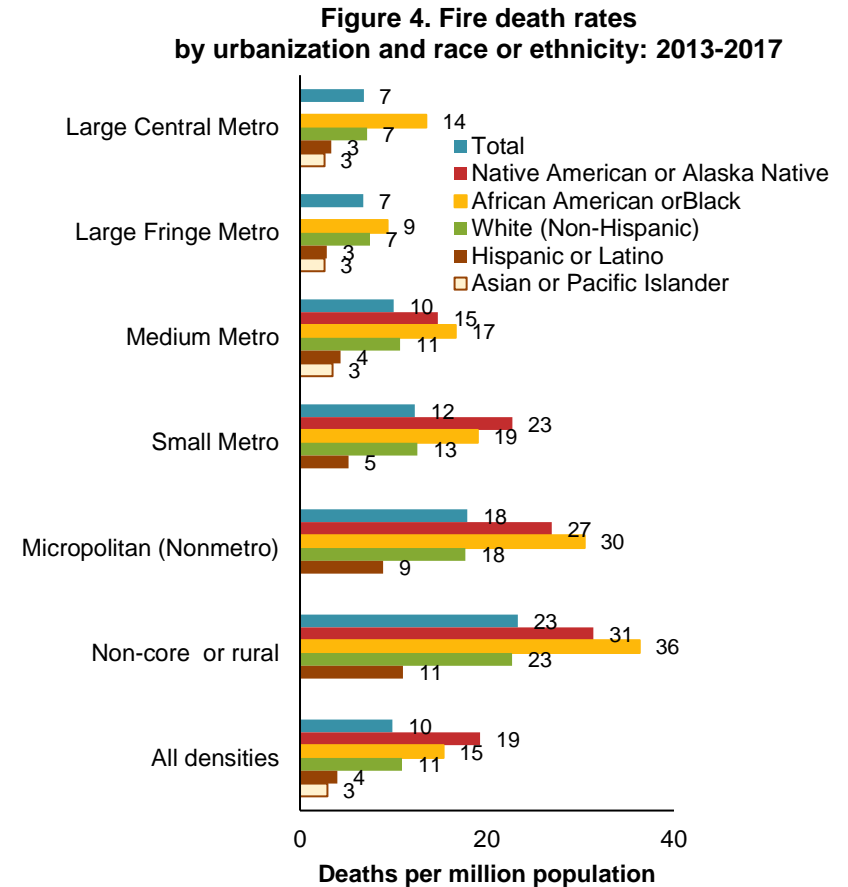
The same study also found that the most rural counties had the highest fire death rates.

### Rural or urban

This analysis found that five of the 10 states with the highest fire death rates were also among the states with the largest percentage of their residents living in rural areas according to the 2010 Census.

Figure 4 shows fire death rates according to the 2013 NCHS urban-rural scheme for counties. Because of the small number of total Native American and Asian American deaths, some rates were considered unreliable and not shown. Counties with the two lowest

categories of population densities had the highest fire death rates for all the races and ethnicities.



Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death, through WISQARS.

A 2017 study of residential fire deaths in Sweden found that the death rate was highest in “sparsely populated municipalities.”<sup>6</sup>

## Adult smokers

Eight of the top 10 states with the highest fire death rates were among the 11 states with the highest percentages of adult smokers. (There was a tie for 10<sup>th</sup> highest percentage of smokers.)

According to the 2018 NFPA<sup>®</sup> report, *Home Structure Fires*, only 5 percent of reported home fires in 2012–2016 were started by smoking materials, but these fires accounted for 23 percent of total home fire deaths, making smoking the leading cause of fire death over the combined 5-year period.<sup>7</sup>

CDC's National Health Interview Survey found that 17 percent of US adults used a "combustible tobacco product" (smoked) every day or some days in 2017.<sup>8</sup> Native Americans and Alaska Natives had the highest smoking rate. Smoking rates were highest in the Midwest, followed by the South. Smoking rates fell as educational and income levels increased. Smoking rates were twice as high among those who reported serious psychological distress. Older adults were less likely to smoke than other age groups. People with disabilities were more likely to smoke.

## Disability

Eight of the 10 states with the highest fire death rates were among the 10 states with the highest percentage of people with disabilities.

In its 2014 report on physical disability and home fire deaths, NFPA noted that a physical disability contributed to an estimated average of 400 (15 percent) of home fire deaths per year in 2007–2011.<sup>9</sup> Forty-two percent of the fire victims with a physical disability were killed by fires started by smoking materials. People with disabilities often need more time to escape, assuming they are able to self-rescue.

According to CDC's infographic, "Adults with Disabilities: Ethnicity and Race," three of every 10 Native American or Alaskan Native adults have a disability.<sup>10</sup> This is true for one of every four in the African American or Black population, one in five Whites, one in six native Hawaiian or Pacific Islanders, one in six Hispanics, and one in 10 Asian people in the United States. Forty-one percent of Native Americans or Alaska Natives who had disabilities smoked.

## Discussion

These risk factors are correlated with each other and so tend to explain some of the same variations in state fire death rates. A state that ranks high in one or more of these risk factors could be expected to rank higher in state fire death rate, and a state that ranks low in risk factors could be expected to have a lower state fire death rate.

For example, West Virginia, Mississippi, and Arkansas are all among the highest 10 states on at least four of the major risk factors and had the three highest average state fire death rates. Hawaii, California, and Utah were in the lowest 10 states on at least three of the major risk factors and had the lowest fire death rates. Information about and comparisons of specific states with each other or the entire United States are available at <https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Fire-deaths-by-state>.

Particularly in states with lower population, fire death rates can be heavily influenced by a fire that kills several people.

Fire deaths are not an inevitable consequence of any factor. Effective programs—such as universal public fire and life safety education, wider use of home fire protection systems, and strong consensus codes with strong enforcement—can reduce fire death rates over time in any state.

## Appendix A. Data Sources, Methods, and Definitions

### Death certificate data

This analysis is based on the national database of death certificates collected by the National Center for Health Statistics (NCHS). The Centers for Disease Control and Prevention's (CDC's) [Web-based Injury Statistics Query and Reporting System \(WISQARS™\) Fatal Injury Reports](#) provided counts of residents of each of the 50 states with fire or flame coded as an external cause of fatal injury. All intents (intentional, unintentional, and unknown intent) were counted. Death certificates are coded by local medical authorities, using codes defined by the International Classification of Diseases (ICD), prepared by the World Health Organization. Death certificate data are then compiled by the states and finally by NCHS.

WISQARS also provided population data from the US Census and death rates per 100,000 population. From 1981 through 1998, the ninth edition of the ICD codes were used. ICD-10 codes have been used for death certificates from 1999 on.

Queries were done in June and July 2019. Five-year averages are shown for most periods except for 1996–1998, the last three years of ICD-9 data, and 1999–2002, the first four years of ICD-10. Although the averages are, in some cases, less than 10, the five-year totals were, in all cases, greater than 10 in keeping with CDC's confidentiality policy.

In WISQARS and this analysis, "state" is the state where the victim lived. Local fire departments and state fire authorities are likely to track victims who died as a result of fires in their state, even if they were not state residents. Through the annual fire experience survey, NFPA develops estimates of civilian fire deaths based on data from local fire departments.

[CDC documentation](#) shows that in ICD-9, fire or flame deaths were identified by external cause of injury codes E890-E899 (unintentional), E958.1 (suicide by fire or flame), E968.0 (homicide

by fire or flame), and E988.1 (fire or flame of undetermined intent), while in ICD-10, these deaths were identified by external cause of injury codes X00-X09 (unintentional), X76 (suicide), X97 (homicide), and Y26 (undetermined intent).<sup>11</sup> WISQARS notes a separate code was added for terrorism. Consequently, the deaths caused by the events of September 11, 2001 were not considered fire deaths.

Vehicle fire deaths, particularly those resulting from post-crash fires, may be captured under transport codes in the death certificate dataset, but are included in the fire deaths captured in NFPA estimates.

### Other demographic data

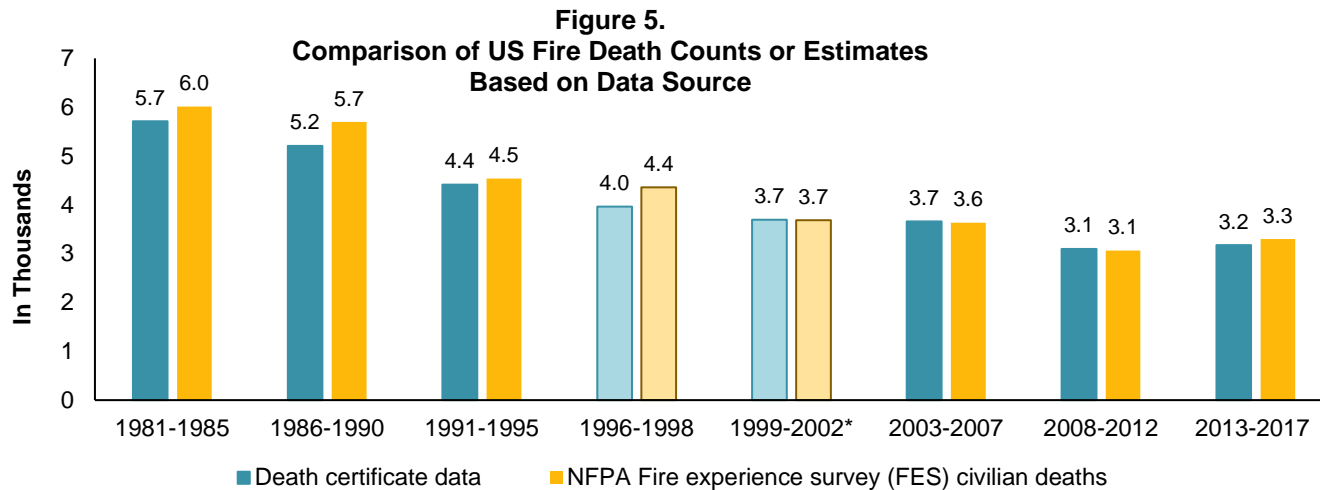
- State population estimates from the US Census were obtained with WISQARS queries of the death certificate data.
- The percentage of a state's population with incomes below the poverty line was taken from the [American Community Survey \(ACS\) Poverty Status in the past 12 months: 2013-2017 five-year estimates](#).
- The percentage of adults who are current smokers was obtained from the CDC's [Behavioral Risk Factor Surveillance System 2013-2017](#).
- The percentage of people living in the community with a disability was obtained from the [ACS Disability Characteristics: 2013-2017 five-year estimates](#).
- The percentage of each state's population living in rural communities in 2010 was obtained from the US Census Bureau's "[Urban and rural population by state, 2010](#)."
- The percentage of population belonging to several groupings defined by racial or ethnic characteristics was obtained from the 2012–2016 five-year estimates of [demographics and housing in the US Census Bureau's American Community Survey \(ACS\) demographic and housing data](#).

## Comparing state data, the NFPA fire experience survey, and death certificate data

State fire agencies and NFPA national estimates of civilian fire deaths capture slightly different data than do death certificates. As mentioned earlier, state death tolls in this analysis are based on the victim’s residence, not where the fire occurred. Fire departments may not be informed of a death that occurs after hospitalization. Deaths from a post-collision fire may be grouped with transportation rather than fire in the ICD codes. NFPA estimates are projections

based on the NFPA fire experience survey of a subset of fire departments, not a complete census. Firefighter fatalities were not included in these NFPA estimates.

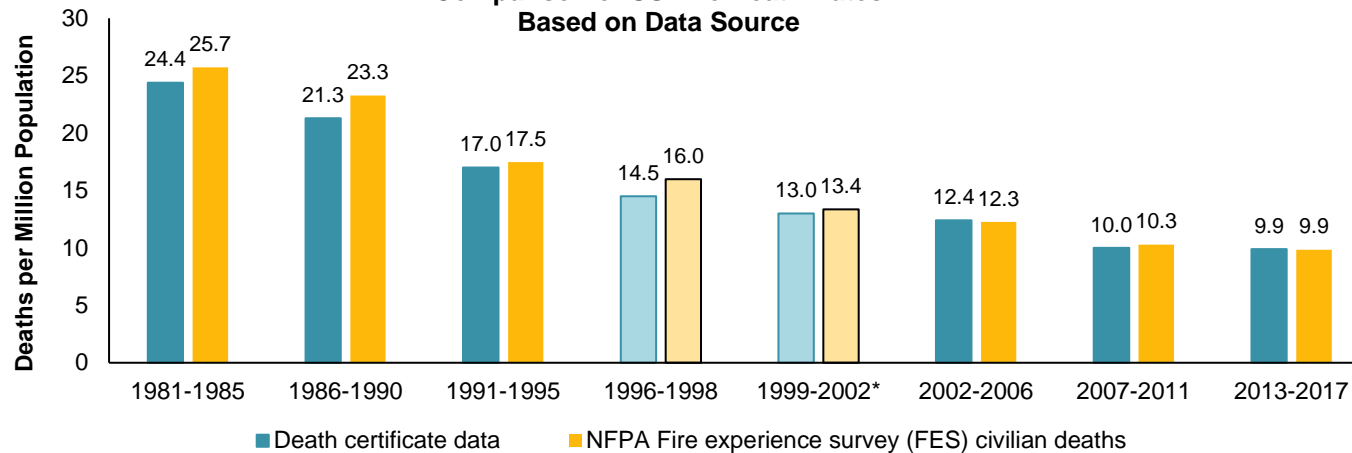
Figure 5 shows that the difference between national fire death counts from the death certificate data and the NFPA estimate of civilian fire deaths, while Figure 6 compares the death rates per million population. Differences between the two systems have decreased over time. The transition years from ICD-9 to ICD-10 are shown in lighter shades.



\* Does not include the fatalities from the events of September 11, 2001.



**Figure 6.  
Comparison of US Fire Death Rates  
Based on Data Source**



\* Does not include the fatalities from the events of September 11, 2011.

<sup>1</sup>David Bishai and Sunmin Lee, “Heightened risk of fire deaths among older African Americans and Native Americans,” *Public Health Reports* 62(3) (2010): 406–413. doi:10.1177/003335491012500309, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2848265/>, Accessed in August 2019.

<sup>2</sup>Rebecca A. Karb, S.V. Subramanian, and Eric W. Fleegler, “County Poverty Concentration and Disparities in Unintentional Injury Deaths: A Fourteen-Year Analysis of 1.6 Million U.S. Fatalities,” *PLoS ONE* 11(5) (2016): e0153516. <https://doi.org/10.1371/journal.pone.0153516>, Accessed in August 2019

<sup>3</sup>US Census Bureau, “Table 3. People and Families in Poverty by Selected Characteristics: 2016 and 2017,” *Current Population Survey, 2017 and 2018 Annual Social and Economic Supplements*. Accessed at [https://www2.census.gov/programs-surveys/demo/tables/p60/263/pov\\_table3.xls](https://www2.census.gov/programs-surveys/demo/tables/p60/263/pov_table3.xls) on September 3, 2019.

<sup>4</sup>Lance Hannon and Donna Shai, “The Truly Disadvantaged and the Structural Covariates of Fire Death Rates,” *The Social Science Journal* 40 (2003): 134.

<sup>5</sup>Karb, Subramanian, and Fleeger (2016).

<sup>6</sup>Anders Johnson, Carl Bonander, Finn Nilson, and Fredrik Huss, “The state of the residential fire fatality problem in Sweden: Epidemiology, risk factors, and event typologies,” *Journal of Safety Research* 62 (2017): 89–100, <https://doi.org/10.1016/j.jsr.2017.06.008>, Accessed on August 29, 2019.

<sup>7</sup>Marty Ahrens. *Home Structure Fires* (Quincy, MA: National Fire Protection Association, 2018).

<sup>8</sup>Teresa W. Wang, Kat Asman, Andrea S. Gentzke, et al., “Tobacco Product Use Among Adults—United States, 2017,” *MMWR Morb Mortal Wkly Rep* 67 (2018):1225–1232. DOI: [https://www.cdc.gov/mmwr/volumes/67/wr/mm6744a2.htm?s\\_cid=mm6744a2\\_w](https://www.cdc.gov/mmwr/volumes/67/wr/mm6744a2.htm?s_cid=mm6744a2_w) Accessed August 28, 2019.

<sup>9</sup>Marty Ahrens, *Physical Disability as a Factor in Home Fire Deaths* (Quincy, MA: National Fire Protection Association, 2014).

<sup>10</sup>Centers for Disease Control and Prevention, Infographic: “Adults with Disabilities: Ethnicity and Race.” Accessed at <https://www.cdc.gov/ncbddd/disabilityandhealth/materials/infographic-disabilities-ethnicity-race.html> on August 28, 2019.

<sup>11</sup>G. Bergen, LH Chen, M Warner, and LA Fingerhut, *Injury in the United States: 2007 Chartbook* (Hyattsville, MD: National Center for Health Statistics, 2008), 158. <https://www.cdc.gov/nchs/data/misc/injury2007.pdf>.