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Struck-by-Lightning Deaths in the United States

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Abstract

The objective of the research reported here was to examine the epidemiologic characteristics of struck-by-lightning deaths. Using data from both the National Centers for Health Statistics (NCHS) multiple-cause-of-death tapes and the Census of Fatal Occupational Injuries (CFOI), which is maintained by the Bureau of Labor Statistics, the authors calculated numbers and annualized rates of lightning-related deaths for the United States. They used resident estimates from population microdata files maintained by the Census Bureau as the denominators. Work-related fatality rates were calculated with denominators derived from the Current Population Survey of employment data. Four illustrative investigative case reports of lightning-related deaths were contributed by the New Mexico Office of the Medical Investigator. It was found that a total of 374 struck-by-lightning deaths had occurred during 1995–2000 (an average annualized rate of 0.23 deaths per million persons). The majority of deaths (286 deaths, 75 percent) were from the South and the Midwest. The numbers of lightning deaths were highest in Florida (49 deaths) and Texas (32 deaths). A total of 129 work-related lightning deaths occurred during 1995–2002 (an average annual rate of 0.12 deaths per million workers). Agriculture and construction industries recorded the most fatalities at 44 and 39 deaths, respectively. Fatal occupational injuries resulting from being struck by lightning were highest in Florida (21 deaths) and Texas (11 deaths). In the two national surveillance systems examined, incidence rates were higher for males and people 20–44 years of age. In conclusion, three of every four struck-by-lightning deaths were from the South and the Midwest, and during 1995–2002, one of every four struck-by-lightning deaths was work-related. Although prevention programs could target the entire nation, interventions might be most effective if directed to regions with the majority of fatalities because they have the majority of lightning strikes per year.

Introduction

In the United States, the average annual numbers of deaths from lightning exceeds the number from other natural disasters (e.g., earthquakes, tornadoes, and blizzards) (Cooper & Andrews, 1995). Millions of lightning strikes occur every year, and although the risk of being struck is low, the consequences of lightning injuries are serious. Published data indicate that an average of 82 persons die each year, and a preponderance of deaths occur among males and people 15–44 years of age (Centers for Disease Control and Prevention [CDC], 1998). Sequelae of lightning injuries include neurologic and neuropsychologic disorders, seizures, brain injury, spinal artery syndrome, blindness, amnesia, anxiety attacks, and peripheral nerve damage (Cooper, 1995). Fatalities and sequelae are common among young people (Cherington, 2003). Data on the direct and indirect costs of lightning injuries are lacking, yet the magnitude of morbidity and mortality has been documented for decades.

Not everyone struck by lightning dies, and although the National Weather Service issues weather warnings for severe thunderstorms, safety from lightning remains each person's responsibility because no OSHA regulations exist to protect workers. Ongoing analyses of struck-by-lightning deaths are needed to alert and remind the public of this danger.

To determine the recent epidemiologic characteristics of lightning-related deaths in the United States, two data sources were analyzed: the National Center for Health Statistics (NCHS) mortality tapes, and the Census of Fatal Occupational Injuries (CFOI).

Methods

The authors analyzed data from CDC's National Center for Health Statistics (NCHS) multiple-cause-of-death public-use data tapes (CDC, 2003) for the interval from January 1, 1995, through December 31, 2000. These mortality data were compiled from death certificates submitted from the vital-records offices of all 50 states in the United States and the District of Columbia. Unnatural causes of death are recorded on the death certificate by the medical examiner or coroner—whenever

Regions and Corresponding States

Region	State
South	Virginia, West Virginia, Kentucky, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, Delaware, Maryland, District of Columbia, Oklahoma, and Tennessee
West	Washington, Montana, Wyoming, Idaho, Oregon, Colorado, Utah, Nevada, California, Arizona, New Mexico, Hawaii, and Alaska
Midwest	North Dakota, South Dakota, Minnesota, Wisconsin, Michigan, Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, and Iowa
Northeast	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, and New Jersey

an autopsy is performed, whenever a case is referred for investigation, or whenever the death falls under his or her jurisdiction (e.g., unnatural or suspicious deaths)—according to a format specified by the World Health Organization and endorsed by CDC. NCHS data were coded according to the *International Classification of Diseases* codes (ICD-9) (World Health Organization, 1977) for cause of death, including underlying external cause of death. The authors identified lightning deaths through external-cause-of-death Code E907 (lightning) for the years 1995 through 1998 (ICD-9). Multiple-cause-of-death tapes for 1999 and 2000 were coded in accordance with the ICD-10. The external-cause-of-death code corresponding to lightning in this new coding scheme is X33. The different coding schemes did not affect lightning deaths because the match from ICD-9 to ICD-10 was simple and straightforward. The issue of comparability between the two revisions of the ICD is more complicated, however, and goes beyond simply finding a comparable code (Anderson, Miniño, Hoyert, & Rosenberg, 2001).

The frequencies of lightning incidence during the reporting period were presented for specific age groups (0–19 years, 20–44 years, and ≥45 years) and race (white, black, other). The authors did not calculate fatality rates for characteristics such as race or by state because of low cell counts. Rates were calculated on the basis of U.S. resident estimates from population microdata files maintained by the Census Bureau for individual years (U.S. Census Bureau, 2003). Appropriate 95 percent confidence intervals were calculated for the rates on the basis of standard errors for random variation in the number of deaths each year, as recommended by NCHS (Murphy, 2000). Negative binomial regression was used to determine the significance of the decline in rates during the interval (Cummings, Norton, & Koepsell, 2001).

The Census of Fatal Occupational Injuries (CFOI) is maintained by the Bureau of Labor Statistics (BLS) (Windau, Jack, & Toscano, 1998). Because the CFOI is compiled from different federal, state, and local administrative sources, the data cover all 50 states and the District of Columbia. CFOI is the most comprehensive work-related surveillance data system in the United States. Data are compiled from death certificates, worker's compensation reports and claims, reports to various regulatory agencies, medical-examiner reports, police reports, and news reports. Participating state agencies verify all fatal occupational injuries and obtain descriptive information on the circumstances surrounding each fatal event. Fatalities are counted if at least two data sources indicate a work relationship or a single-source document contains sufficient information for inclusion (Windau et al., 1998). CFOI data have been available since 1992.

CFOI data are coded for source, nature, body part involved, and the type of event leading to the work fatality, in accordance with the Occupational Injury and Illness Classification System (OIICS) (American National Standards Institute, 1996), a coding system developed by BLS. Industry is coded according to the 1987 Standard Industrial Classification System (SIC), a classification of establishments by their structure and economic activities (U.S. Office of Management and Budget, 1987). A key requirement for inclusion of cases in the surveillance system is that the decedents must have been employed (wage and salary workers) at the time of the event, engaged in a legal work activity, or present at the site as a requirement of their job.

The CFOI surveillance data covered all industries, occupations, and types of injury events leading to work-related fatalities and placed no age restrictions on the inclusion of deaths in the system. For this analysis, fatalities attributed to Event Code 315 of the Occupational Injury and Illness Classification Structures (struck-by-lightning) were selected. Fatality rates were calculated with denominators derived from the Current Population Survey (CPS) of employment data (U.S. Department of Labor, 2003). Fatality rates were not calculated for certain characteristics because employment estimates were not available (e.g., employment data are not available for youth less than 16 years of age). Instead, proportions were used to describe the distribution of victims.

The Office of the Medical Investigator (OMI) is the statewide centralized medical examiner agency for New Mexico. Lightning deaths are coded with the designation A60 in the OMI electronic database. From 1991 through 2002, a total of 17 lightning-associated deaths were reported to and investigated by OMI. Four OMI cases are included below to detail the circumstances of these fatalities.

Results

NCHS data identified 374 struck-by-lightning deaths from 1995 to 2000, for an annualized rate of 0.23 deaths per million persons (Table 1). During 1995–2000, a nonsignificant decline in year-to-year lightning death rates occurred ($p = .0577$). More than half of the fatalities occurred among people 20–44 years of age (201 deaths, 54 percent). A total of 317 deaths occurred among males (85 percent). Eighty-nine percent of fatalities (332 deaths) occurred among whites; 8 percent, or 29 deaths, occurred among blacks; and 3 percent, or 13 deaths, occurred among people of other and unspecified races.

Fatalities varied by state and region (refer to sidebar for region designations). Rhode Island, North Dakota, Hawaii, Delaware, and Alaska did not record any incidents during the period. Twenty-two states recorded one to five deaths; 14 states recorded six to 10 deaths; and 10 states recorded ≥10 deaths (Table 2). Texas (32 deaths) and Florida (49 deaths) together accounted for 22 percent of fatalities. Fatalities were concentrated in the South (203 deaths, 54 percent) and the

TABLE 1

Number and Rates of Struck-by-Lightning Deaths per 1 Million People (NCHS), United States, 1995–2000

Year	Age Group			Total per Year	Annual Rate[a]
	0–19 Years	20–44 Years	≥45 Years		
1995	15	40	21	76	0.29 (0.23–0.36)
1996	14	34	15	63	0.24 (0.18–0.30)
1997	13	29	16	58	0.22 (0.17–0.28)
1998	10	37	16	63	0.23 (0.18–0.30)
1999	10	37	17	64	0.24 (0.18–0.30)
2000	11	24	15	50	0.18 (0.14–0.24)
1995–2000 (Total)	73	201	100	374	
1995–2000 (Rate)	0.16 (0.12–0.20)[b]	0.33 (0.28–0.38)[b]	0.18 (0.15–0.22)[b]	0.23 (0.21–0.25)[b]	

[a]Rate per 1,000,000 people.
[b]( ) = Confidence intervals.

TABLE 2

Distribution of Struck-by-Lightning Deaths by State, United States, 1995–2000

States	Number of Deaths
Vermont, South Dakota, New Hampshire, Nevada, Maine, District of Columbia, Wyoming, New Jersey, Massachusetts, Connecticut, California, West Virginia, Washington, Oregon, Nebraska, Missouri, New Mexico, Montana, Iowa, Idaho, Arkansas, New York	1–5
Oklahoma, Kentucky, Mississippi, Illinois, Wisconsin, Utah, Minnesota, Maryland, Kansas, Virginia, South Carolina, Pennsylvania, Michigan, Tennessee	6–10
North Carolina, Georgia, Alabama, Ohio, Louisiana, Indiana, Arizona, Colorado, Texas, Florida	>10

Midwest (83 deaths, 22 percent). The West recorded 65 deaths, and 23 deaths were from the Northeast. Rates per million persons and the corresponding 95 percent confidence intervals by region were as follows: South, 0.52 (0.46–0.58); West, 0.18 (0.14–0.23); Midwest, 0.22 (0.18–0.27); and Northeast, 0.07 (0.05–0.11).

During 1995–2002, a total of 129 work-related fatalities involved being struck by lightning in the United States for an average annual rate of 0.12 deaths per million workers (Table 3). A nonsignificant decline in work-related lightning death rates occurred during the study period ($p = .1182$). Seventeen deaths occurred in 1995, 18 deaths in 1996, 22 deaths in 1997, 21 deaths in 1998, 13 deaths in 1999, seven deaths in 2000, 15 deaths in 2001, and 16 deaths in 2002. Workers 20–44 years of age accounted for 67 percent (86 deaths) of the fatalities. Seventy-eight percent of the victims (101 deaths) were wage and salary workers, whereas 28 victims were self-employed. All but two victims were male.

Ninety-two percent of incidents (119 deaths) were recorded in the period from May through September (May 9, June 28, July 36, August 34, and September 12). Lightning strike was the primary source of injury among 124 victims (a source of injury is the object, substance, or exposure that directly inflicted or produced the injury). People identified as white (75 deaths, 58 percent) or Hispanic (41 deaths, 32 percent) accounted for approximately four of every five fatalities (116 deaths, 90 percent). The most predominant work activities resulting in death were construction (25 percent, 32 deaths) and material handling (e.g., loading and unloading) (12 percent, 16 deaths).

A farm (e.g., farmland under cultivation, fields, and meadows) was the most important location of injury (42 deaths, 33 percent). Other locations include industrial locations (e.g., construction sites except residential) (30 deaths), and private residences (e.g., residential construction sites) (16 deaths). Agricultural industry accounted for 44 deaths, and 39 deaths occurred from lightning strike in the construction industry. Farming, forestry, and fishing occupations recorded the greatest number of deaths (46 deaths, 36 percent), although the fatality rate was slightly higher among construction workers (0.45 versus 0.59 per million workers). Texas (11 deaths) and Florida (21 deaths) accounted for one of every four work-related lightning deaths.

Case Reports from the New Mexico Office of the Medical Investigator

Case 1
A man 53 years of age left home to herd sheep before a thunderstorm occurred. He was found dead the next day, lying in the middle of a trail with his dead dog and horse. The decedent had burn marks all along his left side, his jacket zipper was melted, the bottoms of his shoes were blown out, and ammunition cartridges in his pocket appeared to have exploded. The dog and horse had burn marks on their bodies.

Case 2
It was raining, with lightning, when a man 56 years of age left home to herd sheep. He was found later lying dead beneath a blown-apart tree. His cap, which lay nearby, was split and

TABLE 3

Distribution of Struck-by-Lightning Work-Related Deaths (CFOI), United States, 1995–2002

Characteristics	Frequency (%)[a]	Rate[b] (CI)[c]
Years		
1995	17 (13)	0.13 (0.08–0.22)
1996	18 (14)	0.14 (0.08–0.22)
1997	22 (22)	0.17 (0.22–0.26)
1998	21 (21)	0.16 (0.01–0.24)
1999	13 (10)	0.10 (0.05–0.17)
2000	7 (5)	0.05 (0.02–0.11)
2001	15 (12)	0.11 (0.06–0.18)
2002	16 (12)	0.12 (0.07–0.19)
Age groups		
0–19 years	6 (5)	
20–44 years	86 (67)	0.13 (0.11–0.16)
≥45 years	28 (22)	0.08 (0.05–0.11)
Unknown	9 (7)	
Race or ethnic origin		
White	75 (58)	0.09 (0.7–0.11)
Black	9 (7)	0.08 (0.04–0.15)
Hispanic or Latino	41 (32)	0.38 (0.27–0.51)
Other or unknown	4 (3)	0.04 (0.01–0.11)
Worker activity		
Vehicular and transportation operations	12 (9)	
Using or operating tools, machinery	10 (8)	
Constructing, repairing, maintenance	32 (25)	
Material handling operation (e.g., loading)	16 (12)	
Other	59 (46)	
Location		
Industrial place (e.g., construction site)	30 (23)	
Farm (fields, farm under cultivation)	42 (33)	
Private residence	16 (12)	
Place for recreation and sport	10 (8)	
Other	31 (24)	
Industry		
Agriculture, forestry, fishing	44 (34)	0.45 (0.34–0.62)
Construction	39 (30)	0.59 (0.42–0.81)
Manufacturing	6 (5)	0.04 (0.01–0.08)
Transportation and public utilities	8 (6)	0.13 (0.06–0.26)
Services	11 (9)	0.04 (0.02–0.07)
Government	13 (10)	0.08 (0.04–0.14)
Other	8 (6)	
State of injury (data not shown for low frequencies)		
Colorado	7	
Florida	21	
Georgia	9	
Illinois	5	
Tennessee	8	
Texas	11	
Total	129 (100)	0.12 (0.10–0.14)

[a]Percentages are rounded and might not equal 100.
[b]Annual rate per 1,000,000 employed persons.
[c](CI) = Confidence intervals.

burned. His left boot was split, and his T-shirt was burned and melted along the left side. Similar burns were observed on his pants.

Case 3

A man 71 years of age was fishing when a thunderstorm occurred. Shortly after, he was found unresponsive lying on the ground approximately 30 feet from his vehicle. He was still holding onto his fishing rod. Resuscitation efforts were unsuccessful. The decedent had an entrance lightning burn on the left side of his neck. There was a lightning exit burn on his right foot. The right side of his shirt, undershirt, pants, and socks were torn.

Case 4

A man 58 years of age was riding a bicycle with his granddaughter. He took shelter under a tree when it started to rain and hail. A bolt of lightning struck and killed him while he was holding onto the bicycle. His shirt and jacket were charred over the right sleeve and left shoulder. The right pant leg was charred. Lightning burns were visible over his left shoulder, right hip, right chest, and right arm.

Discussion

The incidence of lightning-related deaths in the United States has declined. The authors determined that an average of 62 people die of lightning-related deaths every year, compared with previous NCHS-based studies that indicated an average 106 deaths per year from 1968 through 1985 (Dulcos & Sanderson, 1990) and 82 deaths per year from 1980 through 1995 (CDC, 1998). Certain factors might have contributed to this decline, including a) the availability of lightning safety guidelines for individual people, coupled with an increased level of individual awareness about safety so that fewer people are exposed to lightning risks, and b) medical recommendations for treating victims combined with improvement in medical therapy (Zimmermann, Cooper, & Holle, 2002). The decline in lightning-related deaths, however, also follows the general declining trend of injury-related deaths in the United States (CDC, 2002).

Data on lightning-associated deaths reflect estimates, and the correct number of deaths is impossible to obtain (Lifschltz & Donoghue, 1993). For example, discrepancies between the frequencies of lightning-related deaths reported in the NCHS multiple-cause-of-death tapes and medical examiners' reports have been documented (Lifschltz & Donoghue, 1993). Although accurate counts of lightning-related deaths might be impossible to obtain, it is reasonable to assume that the data captured in the CFOI surveillance system are more accurate and reliable because of its inclusion criteria and the method used to ascertain decedents.

The majority of the deaths covered in this study were concentrated during May–September, a period of frequent thunderstorms. People 20–44 years of age accounted for the majority of deaths, and males were over-represented in these deaths (males are more often involved in outdoor employment than females). These findings are consistent with those of previous studies (Cooper, 1995; Lifschltz & Donoghue, 1993). The majority of incidents occurred in the South and the Midwest. These two regions also represent the majority of states with work-related lightning deaths. Concentration of farming enterprises in these regions could partly explain the higher proportion of agriculture work–related lightning deaths. Because no OSHA regulations exist on lightning-related safety, it would be appropriate for the public health community to provide educational activities addressing the potential dangers of lightning.

The U.S. National Lightning Detection Network has published the average number of lightning strikes per year for each state (U.S. National Lightning Detection Network, 2004). According to this source, Florida and Texas recorded the most lightning strikes per year, at 1,322,177 and 1,684,234 strikes, respectively. An average of 9,673,342 strikes per year occur in the South, 5,031,969 in the Midwest, 3,301,908 in the West, and 597,752 in the Northeast. The greatest number of lightning deaths are generally in the areas with the most lightning strikes. Although incidences of deaths have declined, further improvements could be made if regions and states with particularly high incidences took an active role in prevention campaigns (e.g., awareness and education) before May each year. The cases from the New Mexico Office of the Medical Investigator demonstrate different circumstances (occupational and recreational) under which a person could be struck by lightning and the need for vigilance during outdoor activities (e.g., fishing, walking, and farming). Unfortunately, during the study period, work-related deaths did not demonstrate a significant decline. Measures for preventing lightning-related deaths and injuries have previously been published (CDC, 1998; Cooper, 1995; Dulcos & Sanderson, 1990; Zimmermann et al., 2002; Lifschltz & Donoghue, 1993).

The lack of narrative text in the NCHS mortality multiple-cause-of-death data constitutes a limitation because circumstances contributing to injury might not be recorded. Similarly, data from CFOI have limited text-based fields in which the circumstances of the injuries can be described. Data from medical examiners and coroners, however, often provide supplemental information to complement data available from national surveillance systems and to improve understanding of this problem. The authors focused exclusively on lightning deaths, but the public health impact of lightning-related injuries includes hospitalizations, emergency department visits, and disability among those who survive. At least one study indicated that 30 percent of lightning victims die and 74 percent of survivors have permanent disabilities (Cooper, 1980). Further studies of lightning-related morbidity are needed to truly understand the impact of lightning.

During 1995–2000, three of every four struck-by-lightning deaths were from the South and Midwest, and one of every four struck-by-lightning deaths was work-related. Etiologic factors can be used to set prevention priorities, allocate resources, and evaluate interventions. Focused prevention efforts (e.g., interventions to reduce work-related deaths among farming and construction workers) and information-based approaches to reducing lightning-related deaths among agricultural workers, who often are concentrated in rural areas, are still needed. Because young and productive age groups are usually victims of lightning (Cherington, 2003), prevention programs could target the entire nation; however, interventions might be most effective if directed to regions and states with the majority of fatalities. The effects of prevention strategies on work-related lightning deaths should be evaluated in light of the finding that Hispanic workers comprised a third of the work-related lightning victims but represented 12 percent of overall worker fatalities during 1995–2002.

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REFERENCES

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American National Standards Institute. (1996). American National Standard for Information Management for Occupational Safety and Health (ANSI Publication No. Z16.2-1995). Itasca, IL: Author

Anderson, R.R., Miniño, A.M., Hoyert, D.L., & Rosenberg, H.M. (2001). Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates. *National Vital Statistics Reports, 49*(2). http://www.cdc.gov/nchs/data/nvsr/nvsr49/nvsr49_02.pdf (11 Feb. 2005).

Centers for Disease Control and Prevention. (1998). Lightning-associated deaths—United States, 1980–1995. *Morbidity and Mortality Weekly Report*, *47*(19), 391-394.

Centers for Disease Control and Prevention. (2003). *National Center for Health statistics multiple cause-of-death public-use data, 1995–2000*. Hyattsville, MD: U.S. Department of Health and Human Services.

Centers for Disease Control and Prevention. (2002). *Web-based injury statistics query and reporting system*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. http://www.cdc.gov/ncipc/wisquars/default.htm. (6 Apr. 2004).

Cherington, M. (2003). Neurologic manifestations of lightning strikes. *Neurology, 60*(2), 182-185.

Cooper, M.A. (1995). Emergent care of lightning and electrical injuries. *Seminars in Neurology, 15*(3), 268–278.

Cooper, M.A. (1980). Lightning injuries: Prognostics signs for deaths. *Annals of Emergency Medicine, 9*(3), 134–138.

Cooper, M.A., & Andrews, C.J. (1995). Lightning injuries. In P.S. Auerbach (Ed.), *Wilderness medicine: Management of wilderness and environmental emergencies* (3rd ed.) (pp. 261–289). St. Louis, MO: Mosby.

Cummings, P., Norton, R., & Koepsell, T.D. (2001). Rates, rate denominators, and rate comparisons. In: F.P Rivara, P. Cummings, T.D. Koepsell, D.C. Grossman, & V.M. Ronald (Eds.), *Injury prevention: A guide to research and program evaluation* (1st ed.) (pp. 64-74). New York: Cambridge University Press.

Dulcos, P.J., & Sanderson, L.M. (1990). An epidemiological description of lightning-related deaths in the United States. *International Journal of Epidemiology, 19*(3), 673–679.

Lifschltz, B.D., & Donoghue, E.R. (1993). Deaths caused by lightning. *Journal of Forensic Sciences, 38*(2), 353-358.

Murphy, S.L. (2000). Deaths: Final data for 1998. *National Vital Statistics Report, 48*(11), 1–105.

U.S. Census Bureau. (2003). *United States census, 2000*. Suitland, MD: U.S. Department of Commerce, U.S. Census Bureau. http://www.census.gov/ (6 Apr. 2004)

U.S. Department of Labor. (2003). *Bureau of Labor statistics economic news releases and announcements*. Washington, DC: U.S. Government Prfintfing Office. https://www.bfls.gov/fifif/oshcfofifl.html. (6 Apr. 2004).

U.S. National Lightning Detection Network. (2004). *United States lightning flash density maps: Average number of lightning flashes over the United States*. http://www.crh.noaa.gov/pub/ltg.html.(6 Apr. 2004).

U.S. Office of Management and Budget. (1987). *Standard industrial classification manual, 1987*. Washington, DC: U.S. Government Printing Office.

Windau, J.A, Jack, T.A, & Toscano, G.A. (1998). *State and industry fatal occupational injuries, 1992–96. Fatal workplace injuries in 1996: A collection of data and analysis* (Report No. 922). Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

World Health Organization. (1977). *International classification of diseases: Manual on the international statistical classification of diseases, injuries, and cause of death* (9th Rev. ed.). Geneva, Switzerland: Author.

Zimmermann, C., Cooper, M.A., & Holle, R.L. (2002). Lightning safety guidelines. *Annals of Emergency Medicine, 39*(6), 660–664.