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Heat-Related Mortality—United States, 1997

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ENVIRONMENTAL HEAT exposure can cause illness, injury, and death. This report describes four heat-related deaths that occurred in the United States during 1997 and summarizes risk factors for and reviews measures to prevent heat-related illness, injury, and death.

Case 1. On June 18, in New York City, a previously healthy 61-year-old woman was found dead in a sauna of an apartment building. The sauna room temperature was 90 F (32.2 C). The sauna did not have a timer. Her blood alcohol level was 0.21% (New York State's legal limit is 0.10%). The cause of death was heat exposure associated with acute alcohol intoxication.

Case 2. On July 4, in Oakland County, Michigan, a previously healthy but overweight 14-year-old male was found dead in his home. He had been lifting weights and was wearing only shorts. The outdoor air temperature was 74 F (23.3 C), but the heat was on in the home with the temperature set at 85 F (29.4 C). He had begun a program of lifting weights 2 week before his death. The toxicology report from the autopsy detected no drugs in his serum or urine. The cause of death was acute congestive heart failure caused by strenuous weight lifting and heat exhaustion.

Case 3. On July 18, in New York City, a 37-year-old man was found dead at a transition house for homeless persons with mental illness. During July 17-18, a power failure had occurred in the house, and the ambient temperature was >90 F (>32.2 C). Two days before the power outage, he had complained of influenza-like symptoms. He was taking several medications, including amantadine, lithium, and lorazepam. He died from hyperthermia complicated by lithium therapy for bipolar disorder.

Case 4. On August 5, in Los Angeles, a 47-year-old woman collapsed in her residence, which was not air-conditioned. Paramedics transported her to the hospital, where she was pronounced dead. She had a history of hypertension and weighed approximately 300 lbs; the medical report noted no obvious trauma. The outdoor temperature was at least 100 F (37.8 C). The cause of death was listed as hyperthermia.

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CDC Editorial Note: During 1979-1995, a total of 6615 deaths in the United States were attributed to excessive heat exposure*; of these, 2792 (42%) were "due to weather conditions"; 327 (5%) were "of man-made origin"; and 3496 (53%) were "of unspecified origin." Of the 2744 persons for whom age data were available, persons aged ≥55 years accounted for 1692 (62%), and children aged ≤14 years accounted for 109 (4%) heat-related deaths "due to weather conditions." Except for children aged ≤14, the average annual rate of heat-related deaths increased with each age group, particularly for persons aged ≥55 years. Because other causes of death (e.g., cardiovascular and respiratory diseases) also increase during heat waves,[1,2] heat-related deaths "due to weather conditions" represent only a portion of heat-related excess mortality. The criteria to define a heat-related death differ by state and among individual medical examiners and coroners.[3-5] The National Association of Medical Examiners defines heat-related death as exposure to high ambient temperature either causing the death or substantially contributing to the death.[3]

The cases described in this report highlight risk factors for heat-related death: alcohol consumption, overweight, use of some medications (e.g., neuroleptics and tricyclic antidepressants), and physical activity (e.g., exertion in unusually hot environments).[1,4,6] Other factors associated with increased risk for heat-related illness and death include age (e.g., the very young and the elderly), history of previous heatstroke, chronic conditions (e.g., cardiovascular or respiratory diseases), social circumstance (e.g., living alone), and physical or mental impairment or bed confinement that interferes with ability to care for oneself or to avoid hot environments.[1,4,6] However, all persons can be at risk if exposed to excessive heat.[4]

Adverse health conditions associated with high environmental temperatures include heatstroke, heat exhaustion, heat syncope, and heat cramps.[4] Heatstroke is a medical emergency characterized by rapid onset and progression (within minutes) of the core body temperature to ≥105 F (≥40.6 C) and lethargy, disorientation, delirium, and coma.[4] Heatstroke is often fatal despite expert medical care directed at rapidly lowering the body temperature (e.g., ice baths).[4] Heat exhaustion is characterized by dizziness, weakness, or fatigue often following several days of sustained exposure to hot temperatures and results from dehydration or electrolyte imbalance[4]; treatment for heat exhaustion is directed at replacing fluids and electrolytes and may require hospitalization.[4] Hot weather and standing or mild exercise may increase the likelihood of heat syncope and heat cramps caused by peripheral vasodilation. Treatment of persons with loss of consciousness as a result of heat syncope should include placement in a recumbent position with feet elevated and electrolyte replacement.[4]

Persons working in high temperatures—either indoors or outdoors—should take special precautions, including allowing 10-14 days to acclimate to an environment of high ambient temperature. Adequate salt intake with meals is important; however, salt tablets are not recommended and may be hazardous.[4] Although using fans can increase comfort at temperatures <90 F (<32.2 C), fans are not protective against heat-related illness when temperatures are ≥90 F (≥32.2 C) and humidity >35%.[1,7]

Strategies for preventing heat-related illness during exercise or because of human causes (e.g., saunas) include acclimating to the climate and consulting a health-care professional to develop an exercise regimen.[8,9] Other strategies include increasing time in air-conditioned environments, increasing nonalcoholic fluid intake, exercising only during cooler parts of the day, and taking cool-water baths.[1] Persons whose fluid consumption is restricted for medical reasons should consult their physician before altering their fluid intake.[4] Elderly persons should be encouraged to take advantage of air-conditioned environments (e.g., shopping malls and public libraries), even if only for part of the day.[1,4,6] Public health information about exceptionally high temperatures should be directed toward susceptible populations. For example, parents should be educated about the higher sensitivity to heat of children aged <5 years. When a heat wave is predicted, prevention messages about avoiding heat-related illness should be disseminated to the public as early as possible to prevent heat-related illness, injury, and death.[5]

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*Underlying cause of death attributed to excessive heat exposure, classified according to the *International Classification of Diseases, Ninth Revision* (ICD-9), as E900.0, "due to weather conditions"; E900.1, "of man-made origin"; or E900.9, "of unspecified origin." These data were obtained from the Compressed Mortality File, provided by CDC's National Center for Health Statistics. It contains information from death certificates filed in the 50 states and the District of Columbia through the National Vital Statistics System. Cause of death has been coded in accordance with the provisions of ICD-9.

Sun-Protection Behaviors Used by Adults for Their Children—United States, 1997

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IN THE United States, the high incidence of skin cancer—including basal cell carcinoma, squamous cell carcinoma, and melanoma—has been attributed primarily to sun exposure.[1,2] To reduce exposures to the sun's harmful ultraviolet (UV) rays, the American Academy of Dermatology (AAD), the American Cancer Society, and other organizations have recommended sun-protection practices such as wearing protective clothing, avoiding sun exposure during the midday hours (when the sun's rays are the strongest), and using sunscreen.[3,4] Such practices are especially important for infants and children because sun exposure during the early years of life appears to increase the risk for melanoma, the most serious form of skin cancer.[1] To characterize sun-protection practices among children, AAD conducted a survey of parents with children aged ≤12 years during June-July 1997. This report summarizes the results of the survey, which indicate that three fourths of adults had their children use one or more measures to reduce exposure to UV rays.

Random-digit-dialing was used to compile a sample of households with children aged ≤12 years. Of 1872 households screened, 587 included a child aged ≤12 years. Of these households, 84 refused to participate in the survey, resulting in a sample size of 503 households. One adult per household was interviewed. Demographic characteristics were ascertained, and respondents were asked how often (always, usually, sometimes, or never) they had their child use specific measures to protect themselves from the sun. For households with more than one child aged ≤12 years, one child was randomly selected for reporting in the survey. For the analyses, "always" and "usually" were coded as positive responses and "sometimes" and "never" as negative responses. The statistical differences between the sun-protection behaviors and demographic variables were determined using Chi-square analyses.

Overall, 363 (74%) of 491 adults reported using one or more sun-protection behaviors for their children. The sun-protection behavior most frequently reported was using a sunscreen with a sun-protection factor of ≥15 (257 [53%] of 486), followed by seeking shade (150 [30%] of 499), wearing hats (133 [27%] of 502), and wearing shirts (42 [8%] of 501). Sun-protection behaviors overall were more frequently reported for fair-skinned children and for children of adults who were white than for darker-skinned children and for children of adults who were black. Sunscreen use in particular was more frequently reported for those same subgroups of children and for children with a family history of skin cancer. Women were more likely than men to report sunscreen use for their children. Although sunscreen use did not significantly change with the age of the child, the proportion of children using one or more sun-protection behaviors decreased with age.

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CDC Editorial Note: The findings in this report indicate that a high proportion of parents, particularly parents of children at increased risk for skin cancer (e.g., those who are white, have fair skin, and who have a family history of skin cancer), use sun-protection measures for their children. The most frequently reported sun-protection behavior was sunscreen use. Other means of protection may be more difficult to promote among children, who may not want to wear hats or may be too hot to wear long sleeves.

The findings in this report are subject to at least two limitations. First, many households refused to be screened or had no adult respondent available; therefore, the results may not be representative of all U.S. children. Second, respondents' reporting of sun-protection behaviors may have been influenced by the desire to report in what was perceived to be a socially acceptable manner.

Several organizations, including AAD, the Skin Cancer Foundation, the American Cancer Society, the Food and Drug Administration, and CDC, have initiated educational efforts about sun protection. A recent study found an increased awareness among adults that sun exposure is dangerous, a decline in the belief that having a tan is healthy, and an increase in the reported use of sunscreen. However, study results also suggested an increase in adult UV ray exposure, as measured by increased reports of sunburning and regular use of tanning booths.[5] Targeting health-education messages to children, young adults, and parents may result in further attitudinal and behavioral change in those who engage in high-risk behaviors. The desire to influence a child's behavior may further motivate adults to protect themselves while in the sun and to avoid sunburning. Sun-protection behaviors among children also may be enhanced by including educational components in school health curricula and by environmental measures, such as providing shade structures and scheduling outdoor activities before 10 a.m. or after 4 p.m.

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Community Needs Assessment and Morbidity Surveillance Following an Ice Storm—Maine, January 1998

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On JANUARY 7, 1998, an ice storm struck the northeastern United States and southeastern Canada. In Maine, 3 consecutive days of rain combined with ground temperatures consistently below freezing resulted in heavy accumulations of ice on trees and electric power lines. Falling trees and branches and breaking utility poles resulted in the loss of electrical power to an estimated 600,000 persons. Although the rain had stopped by January 11, temperatures declined to <10 F (<-12 C) over most of the state, exacerbating the danger. On January 16, an estimated 50,000 households, primarily in the interior portion of the state, remained without power. This report summarizes a community needs assessment and a study of emergency department (ED) visits conducted during the aftermath of this storm.

Community Needs Assessment

The Maine Bureau of Health (MBH) and CDC developed a community needs survey to assess the continuing needs of and potential health hazards to residents of the state who remained without power. This assessment was conducted on January 17 in the minor civil division of Norway (1995 population: 4738), which was chosen because (1) it was in the interior region of the state, which received the greatest damage to electrical supply lines; (2) it reportedly contained many homes that remained without power; and (3) it contained a representative mixture of town and rural residential tracts. Maps with 1990 census data were used to randomly select 30 census tracts from the 285 within Norway, with the probability of a tract being selected proportional to the number of residential structures contained within it. Road segments were then mapped to the selected census tracts. These segments were assigned to survey teams who attempted to interview residents from four households residing within each of 30 selected census tracts; some teams were unable to contact four households within their census tract.

On January 17, residents from 111 households were interviewed. Electrical power had been restored to 75 (68%) of these households, 20 (18%) were using gasoline-powered generators to supply electricity, and 16 (14%) had no source of electricity. All but one of the surveyed households without restored power were in rural tracts. In all households, drinking water was available from municipal service, private wells, or water-distribution points. All but one of the 111 households had water to flush toilets and access to transportation. Telephone service remained unrestored in 14 (13%) homes. Residents were listening to a radio or television in 103 (93%) households and, therefore, had access to public service broadcasts.

An average of three persons resided in each surveyed household (range: one to nine persons). Of these, 3% were aged <2 years, and 15% were aged ≥65 years. In homes without any source of electricity, 15% of residents were aged ≥65 years, and none were aged <2 years. The following number of households had at least one resident who had experienced the following adverse health events since the ice storm: vomiting or diarrhea (nine [8%]), cough with fever (five [5%]), severe headache with dizziness (four [4%]), burns (four [4%]), severe cuts (two [2%]), and fractures (one [1%]).

Potentially hazardous sources of carbon monoxide (CO) were present in many homes. Among the 36 households without restored electrical power, eight (22%) used a propane heater, and five (14%) used a kerosene heater. Where a gasoline generator was used for electricity, four (20%) households placed it in an open porch or garage and three (15%) households placed it in an enclosed porch or garage. All other generators were placed outside the residential structure. Of households without restored electrical power, three (8%) reported having a working CO detector.

Morbidity Surveillance

To determine the early health impact of the ice storm, MBH and CDC surveyed the EDs of Stephens Memorial Hospital in Norway and Central Maine Medical Center and St. Mary's Regional Medical Center in Lewiston. These EDs were selected because they were in the region of the state most heavily affected by the storm. ED logs were reviewed for January 7-January 18, 1998 (January 17 at St. Mary's). This review also was conducted for January 8-January 19, 1997 (January 18 at St. Mary's), to provide a reference. On the basis of early reports and previous disaster experience, 14 diagnostic categories were selected for tabulation.

The three EDs treated 1758 patients during the 1997 reference period and 2586 during the post-storm period, a 47% increase. The absolute number of visits for each selected diagnostic category and the proportion of the total visits represented by each category were compared between periods. Presumptive CO poisonings increased from zero to 101 cases. Most of the injury categories showed absolute increases, but proportional increases occurred only with cold exposure (0-0.3%) and burns (0.4%-0.7%). Visits for lower respiratory tract disease (6.3%-7.4%), and cardiac complaints (4.2%-4.6%) were also proportionally higher during the post-storm period.

The results of these two surveys were reported to MBH. Recommendations included continuation of public education about the hazards of CO and further study into the immediate health effects of the ice storm and subsequent power outage. Community outreach activities by local fire departments, which included CO monitoring, were continued in Norway and other areas of the state. CO warnings also were broadcast over the radio. An investigation into the factors involved with the epidemic of CO poisoning began immediately following the survey. Post-storm surveillance, using final physician diagnosis, has been instituted over a wider geographic area to provide more precise estimates of the storm's health impact.

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CDC Editorial Note: The community needs assessment used in this investigation was a modification of the rapid needs assessment technique,[1,2] a methodology that was successfully employed after recent hurricanes[3-5] to guide emergency response efforts. This investigation was the first to use U.S. Census data to guide the assessment. The findings in this report demonstrate that, even after an extended period without power, most residents were able to meet their basic needs for water, food, warmth, and sanitation.

Absolute increases in the number of adverse health events reported from EDs after a disaster must be interpreted with caution. Temporary shifting of patients to hospital-based EDs can occur as independent practitioners encounter difficulties resuming normal operations. Therefore, absolute and proportional changes in reported events should be considered when evaluating this data. Most physician's offices in the interior region of Maine lost power. However, because normal operations resumed relatively rapidly, provider shifting probably occurred less than would be expected after a flood or hurricane.

The findings of this report indicated that CO exposures and poisonings were the most dramatic health concerns in the early aftermath of the ice storm. Although the use of ED logs is an imprecise method of categorizing many diseases, this survey provided timely information that was useful in efforts to quickly focus the public health response. Both the surveillance and community assessment results prompted the state to continue warnings about CO hazards and to investigate the factors involved in instances of CO poisonings.

CO toxicity has been documented as a health concern following winter storms, especially during power outages.[6-8] Many of the same mechanisms observed in previous outbreaks of CO poisoning (e.g., improper use of gasoline generators and fuel-powered heaters) may have played a role in Maine. Review of carboxyhemoglobin levels among reported cases and further investigation of the sources of exposure will be needed to completely characterize the Maine outbreak.

Timely, valid information is important in formulating an effective public health response in the aftermath of any disaster. Rapid needs assessment and emergency medical surveillance remain key tools in providing the early estimates needed to guide response efforts. Continued refinements in the methodology of these investigations and dissemination to the local level of the tools and expertise necessary to perform them will contribute to the rapid collection of important information.

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Satellite Broadcast on Antimicrobial Use and Resistance

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ANTIMICROBIAL Use and Resistance: Solutions to the Problem, a live, interactive satellite broadcast, will be held Thursday, August 20, 1998, from 9 AM to 11:30 AM eastern daylight time (EDT) with a repeat broadcast from 1 PM to 3:30 PM EDT. Cosponsors are CDC, the National Foundation for Infectious Diseases, in collaboration with the Association for Professionals in Infection Control and Epidemiology and the Society for Healthcare Epidemiology of America.

This broadcast will provide an overview of the increasing problem and emergence of antimicrobial resistant pathogens and will describe methods for the surveillance of antimicrobial resistance and assessment of antimicrobial use. Participants also will learn various strategies to improve antimicrobial use and prevent and control the spread of antimicrobial resistant pathogens. Continuing education credits will be awarded for various professions based on 2.5 hours of instruction.

This course is designed for physicians, nurses, infection-control professionals, pharmacists, laboratorians, hospital administrators, and others involved in the prevention and control of antimicrobial resistant pathogens.

Registration information is available through CDC's fax information system, telephone (888) 232-3299; request document number 130018.