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Heat-Related Deaths --- Los Angeles County, California, 1999--2000, and United States, 1979--1998

Heat-related deaths typically occur during summer months. Many of these deaths are preventable. This report describes four cases of heat-related deaths in Los Angeles County, California, during 1999--2000, compares age-, sex-, and race-specific rates in Los Angeles County and the United States during 1979--1998, and summarizes trends in the United States during 1979--1998. Relatives, neighbors, and caretakers of persons at risk for heat-related death should frequently evaluate heat-related hazards, recognize symptoms of heat-related morbidity, and take appropriate preventive action.

Case Reports

Case 1. In June 1999, a 4-month-old boy was found dead in his parents' car. The child had been left in the car with windows closed for 6 hours. Death was attributed to hyperthermia. The temperature inside the car was 118 F (47.8 C), and the outside temperature was 96.0 F (35.6 C).

Case 2. In July 1999, an 81-year-old woman with a medical history of dementia and heart disease was found dead on the roof of the residential-care center where she lived. She had last been seen alive 64 hours earlier and had been reported missing for 24 hours before she was found. The decedent wore a "wanderer" bracelet that sounded an alarm when she exited through the front door of the center. The roof door was not equipped with an alarm but was usually kept locked. Death was attributed to hyperthermia. The ambient temperature on the roof was 96.0 F (35.6 C) at the time the decedent was found.

Case 3. In July 2000, a 46-year-old man was found confused and rolling on the pavement of a parking lot near his residence. When an ambulance arrived, he was unconscious and had had seizures. The local ambient temperature was 109.0 F (42.8 C) at the time he was found. At the emergency department, his temperature was 107.0 F (41.7 C). He died 2 days later in a hospital. Laboratory tests showed a blood alcohol level of 93 mg/dL (the legal blood alcohol limit in California is 80 mg/dL) and a positive screen for cocaine. Death was attributed to hyperthermia.

Case 4. In August 2000, a 65-year-old woman was found unresponsive in the backyard of her residence. She was admitted to a hospital where she died 2 days later. Her body temperature on admission was 108.0 F (42.2 C). The decedent had a medical history of insulin-dependent diabetes, hypertension, and heart disease. The underlying cause of death was hyperthermia.

U.S. Trends and Summary of Rates in Los Angeles County

During 1979--1998 (the most recent years for which national data are available), 7421 deaths in the United States were heat-related* with a median of 274 deaths per year (range: 148--1700), and a median heat-related death rate of 0.1 per 100,000 population (range: 0.1--0.8). Heat-related death rates appear to be stable over time in all age groups with the highest mortality among persons aged ≥65 years (Figure 1).

During 1979--1998, the age-adjusted† heat-related death rate in Los Angeles County was 44% lower than that in the general U.S. population (0.90 per 100,000 population versus 0.16). Los Angeles residents aged ≥65 years were more likely than residents aged <65 years to die from exposure to excessive heat, but the rate ratio was smaller than in the general U.S. population (2.4 versus 7.4). Men in Los Angeles were more likely than women to die from exposure to excessive heat, and the rate ratio of 2.0 was the same as in the general U.S. population. Although blacks in Los Angeles County were more likely than whites to die from exposure to excessive heat, the rate ratio was smaller than in the general U.S. population (1.4 versus 4.9). Persons of other (nonblack and nonwhite§) races in Los Angeles County were less likely than whites to die from exposure to excessive heat, but the rate ratio was smaller than in the general U.S. population (0.5 versus 0.8).

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Editorial Note:

These case reports illustrate some of the risks for hyperthermia. The primary risk factors include age (i.e., increasing age, except children aged <5 years who are at higher risk than older children), behavior (e.g., low fluid intake, excessive exercise, prolonged stay in nonair-conditioned places, and alcohol and/or drug use) (*1*), chronic disease (e.g., cardiac or mental illness) (*2,3*), prescription drugs (e.g., psychotropic medication) (*3*), living conditions (e.g., low income, residence in urban areas, no access to air-conditioning, and social isolation) (*1*), and prolonged outdoor activities (e.g., agricultural work and recreational running).

Heat-related illness can begin as sunburn and fatigue and progress to heat cramps, heat exhaustion, and heatstroke. The two most serious types of heat-related illness are heat exhaustion (heavy sweating, paleness, muscle cramps, tiredness or weakness, dizziness or headache, nausea or vomiting, and faintness) and heatstroke (oral temperature of ≥103.0 F [≥39.4 C]; rapid, strong pulse; red, hot, and dry or sweaty skin; throbbing headache or dizziness; nausea; confusion; and unconsciousness). Untreated heat exhaustion can progress to heatstroke (*4*), a medical emergency that can develop in ≤24 hours (*5*). Even when treated, the death rate for heatstroke may be as high as 33% (*6*). Permanent neurologic damage occurs in up to 17% of survivors (*7*), and its likelihood increases with longer duration of heatstroke (*4*).

Spending time in an air-conditioned area is the most important factor in preventing heat-related deaths (*2*). During the 1999 heat wave in Cincinnati, Ohio, three of 18 heat-related

deaths occurred in assisted-care facilities for persons with mental illness that did not have air-conditioning (*8*). The use of fans does not appear to be protective. If exposure to heat cannot be avoided, prevention measures should include reducing, eliminating, or rescheduling strenuous activities; frequently drinking water or nonalcoholic fluids; frequently taking showers; wearing light-weight and light-colored clothing; and avoiding direct sunshine.

Because heat-related morbidity and mortality could increase with more periods of extreme heat in future summers (*9*), many cities have developed heat emergency response plans. These response plans use information on risk factors and meteorologic information to implement prevention strategies that reduce morbidity and mortality from excessive heat (*1*). A heat response plan also should address rolling energy blackouts in areas that use air-conditioning to mitigate many of the factors that increase the risk for heat-related morbidity and mortality. To defray energy costs, support of low-income populations may be necessary to allow the use of air-conditioning during summer months.

References

1. McGeehin MA, Mirabelli M. The potential impacts of climate variability and change on temperature-related morbidity and mortality in the United States. Environ Health Perspec 2001;109:185--90.
2. Semenza JC, Rubin CH, Falter KH, et al. Heat-related deaths during the 1995 heat wave in Chicago. N Engl J Med 1996;335:84--90.
3. Batscha CL. Heat stroke: keeping your clients cool in the summer. J Psychosoc Nurs Ment Health Serv 1997;35:12--7.
4. Knochel JP. Environmental heat illness: an eclectic review. Arch Intern Med 1974;133: 841--64.
5. Jones TS, Liang AP, Kilbourne EM, et al. Morbidity and mortality associated with the July 1980 heat wave in St. Louis and Kansas City, Mo. JAMA 1982;247:3327--31.
6. Vicario SJ, Okabajue R, Haltom T. Rapid cooling in classic heatstroke: effect on mortality rates. Am J Emerg Med 1986;4:394--8.
7. Hart GR, Anderson RJ, Crumpler CP, Shulkin A, Reed G, Knochel JP. Epidemic classical heat stroke: clinical characteristics and course of 28 patients. Medicine 1982;61:189--97.
8. Kaiser R, Rubin CH, Henderson A, et al. Heat-related death and mental illness during the 1999 Cincinnati heat wave. Am J Forensic Med Pathol(in press).
9. Gaffen DJ. Increased summertime heat stress in the US. Nature 1998;396:529--30.

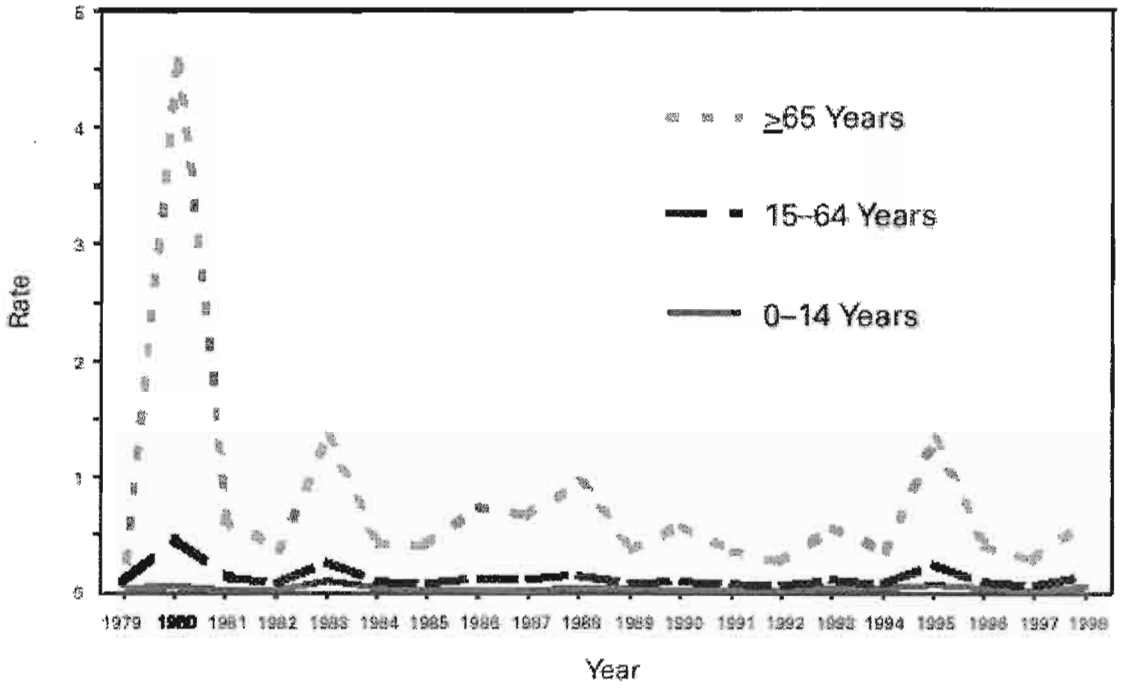
*Underlying cause of death attributed to "excessive heat exposure," classified according to the *International Classification of Diseases, Ninth Revision* (ICD-9), code E900.0, "due to weather conditions" (deaths); code E900.1, "of manmade origin" (deaths); or code E900.9, "of unspecified origin" (deaths). Data were obtained from the Compressed Mortality File of CDC's National Center for Health Statistics, which contains information from death certificates filed in the 50 states and the District of Columbia.

† Rates were age-adjusted to the 2000 U.S. standard population.

§ Race in the Compressed Mortality File was categorized as white, black, and other.

Figure 1

FIGURE 1. Rate* of heat-related deaths, by age group — United States, 1979–1998



* Per 100,000 population.

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