

## Fatal Car Trunk Entrapment Involving Children -- United States, 1987-1998

During July-August 1998, at least 11 U.S. children died in three separate incidents of car trunk entrapment. This report summarizes these three incidents, describes characteristics of car trunk entrapment incidents involving children since 1987, and reviews measures to prevent children from becoming trapped in car trunks. The findings indicate that at least nine incidents of fatal car trunk entrapment involving children occurred during 1987-1998, that all incidents occurred in hot weather and involved children aged less than or equal to 6 years, and that these deaths were preventable.

### Case Reports

**Incident 1.** On July 13, 1998, at approximately 6 p.m., four children aged 2-5 years were discovered inside the closed trunk of a car in Gallup, New Mexico. The children had climbed into the car's open trunk and had not been seen for 1 hour before a search began. They were found approximately 1 hour after the search began. The outside ambient temperature that afternoon was 90 F (32.2 C). The children were rushed to a local emergency department, where three were pronounced dead. The remaining child, a 5-year-old girl, was transported to a tertiary-care hospital, where her rectal temperature was recorded at 108 F (42.2 C); she died on July 14. No carbon monoxide was detected in blood samples of the children. The autopsy report cited hyperthermia and asphyxia as the causes of death.

**Incident 2.** On August 2, 1998, at approximately 1 p.m., two brothers aged 2 and 5 years from Greene County, Pennsylvania, were found dead in the trunk of their parents' car in front of their house. The boys had found the car keys, opened the trunk, and climbed inside. They were missing for several hours during the morning and early afternoon. The outside ambient temperature that afternoon was approximately 85 F (29.5 C). The autopsy report cited hyperthermia and asphyxia as the causes of death.

**Incident 3.** On August 8, 1998, at 4:15 p.m., five girls in West Valley City, Utah, aged 2-6 years, were found dead inside the trunk of a car owned by one of the children's parents. The car had been parked at one of the children's residence. The outside ambient temperature was 100 F (37.8 C). The vehicle's trunk-release lever was adjacent to the driver's seat, and at least one of the two 6-year-old girls reportedly knew how to operate the release lever. The children had not been seen for approximately 20 minutes before a search began and were found approximately 1-1/2 hours after the search began. Liver temperatures taken at the death scene 1-1/2 to 2 hours after the children were found ranged from 99 F to 117 F (37.2 C to 47.2 C). The autopsy report cited the cause of death as hyperthermia.

### Surveillance for Fatalities Associated with Trunk Entrapments, 1987-1998

The LEXIS-NEXIS database (1) was used to search newspapers, magazines, wire services, and broadcast transcripts for additional deaths associated with car trunk entrapment. During 1987-1998, nine incidents were identified of fatal car trunk entrapment involving children, including the three incidents described in this report. Medical examiner/coroner (ME/C) offices were contacted for information about death investigations and autopsy findings. ME/C offices provided written and verbal cause-of-death information for seven of the incidents, and for two incidents, information was obtained from media sources, who cited coroner's reports for cause-of-death information.

A total of 19 children aged less than or equal to 6 years died in the nine incidents. Eighteen children underwent autopsies. The cause of death for all children was either hyperthermia or a combination of hyperthermia and asphyxia. Three of the nine incidents occurred during the summer of 1998 and accounted for 11 (58%) of the 19 deaths. Eight incidents occurred when outside ambient temperatures were at least 90 F (32.2 C) (Table 1), and at least five (56%) of the cars involved were parked in direct sunlight.

The method of trunk entry varied among the nine incidents. In two incidents, children found the keys to their parents' cars and opened the trunks. In two other incidents, children entered trunks without using a key -- either a driver's side trunk-release lever or a manual release on the trunk itself was present. In one additional incident, four children climbed into an open trunk. The method of trunk entry could not be determined for the remaining four incidents. At least 15 children died in cars parked either at their own houses or at a relative's or neighbor's house. In three incidents, a dead child was alone in the trunk. In one incident, one 3-year-old child survived, and a 4-year-old child died. In six incidents, children were missing approximately 1 to 2-1/2 hours. In two other incidents, they were missing for 5-8 hours.

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### Editorial Note

**Editorial Note:** Although heat-related deaths in the United States have been described previously (2,3), the number and characteristics of car trunk entrapment-related deaths have not been described, and the identified cases probably represent a minimum number of such deaths. No surveillance system exists to detect or report car trunk entrapment-related deaths, and no International Classification of Diseases, Ninth Revision, external cause-of-injury code exists for deaths associated with car trunk entrapments.

Heatstroke (hyperthermia) is a medical emergency and is often fatal despite medical care (4). Heatstroke is usually designated when a rectal or core temperature reaches 105 F (40.6 C) (4,5). The car trunk entrapment-related deaths described in this report were mainly heat related -- no deaths were identified that occurred when the outside temperature was less than 85 F (less than 29.5 C), and all causes of death included hyperthermia.

Cars parked in direct sunlight can reach internal temperatures up to 131 F-172 F (55 C-78 C) when outside temperatures are 80 F-100 F (27 C-38 C) (6,7). Cars that are parked in direct sunlight and that are poorly ventilated also reach higher temperatures more rapidly than cars that are parked in the shade or that have windows completely opened (7). Most temperature increases inside cars occur during the first 15 minutes of being left in the sun (8). In at least two incidents during the summer of 1998, deaths occurred in dark cars, and the dark color probably contributed to the intense heat in the trunks (6).

The major mechanism for heat loss by the body in high ambient temperatures is evaporation (7). This mechanism is quickly defeated in the rising humidity of closed car trunks. Younger children are more sensitive to heat than older children and adults and are at greater risk for heatstroke (5). In addition to heatstroke, asphyxia was listed as a contributing cause of death in four of the seven incidents for which ME/C data were obtained. The combination of high temperature, humidity, and poor ventilation all contribute to the extreme danger of car trunks (7).

The findings in this report are subject to at least three limitations. First, because LEXIS-NEXIS may exclude cases in areas with minimal media coverage, may overlook cases that are not in the database because of search technique, and does not contain all newspapers in the country, the total number of cases identified may be underestimated. Second, because primary source ME/C data were not obtained for two incidents, information accuracy in media reports used for analysis is unknown. Third, because autopsy findings are often minimal or nonspecific, determining cause of death for these types of deaths is largely dependent on the circumstances and a thorough examination of the death scene.

State and local public health officials can use the findings in this report to guide prevention messages about children playing in or around car trunks. Effective public health strategies to prevent deaths associated with car trunk entrapments should include

1. preventing children's access to car keys; 2) keeping cars locked, with trunks closed, when cars are not in use; and 3) supervising young children closely when they are around cars.

## References

1. LEXIS-NEXIS {database online}. Dayton, Ohio: Reed Elsevier, 1998.
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6. Zumwalt RE, Petty CS, Holman W. Temperature in closed automobiles in hot weather. *Forensic Sci Gazette* 1976;7:7-8.
7. Surpure J. Heat-related illness and the automobile. *Annals of Emergency Medicine* 1982;11:263-5.
8. Roberts KB, Roberts EC. The automobile and heat stress. *Pediatrics* 1976;58:101-4.

## Table\_1

**Note:** To print large tables and graphs users may have to change their printer settings to landscape and use a small font size.

TABLE 1. Selected characteristics of deaths associated with car trunk entrapments among children, by year -- United States, 1987-1998

Year	No. children	Age (yrs)	Month	Cause of death *	Outside temperature +	Time missing (hrs)
1987	1	4	July	&	101 F (38.3 C)	8
1987	1	3	August	Hyperthermia	91 F (32.7 C)	2
1989	1	5	June	&	106 F (41.1 C)	2 1/2
1993	2	3,5	July	Hyperthermia/ Asphyxiation @	97 F (36.1 C)	&
1994	1	4	August	Hyperthermia	101 F (38.3 C)	1
1995	2	3,4	May	Hyperthermia/ Asphyxiation	90 F (32.2 C)	2
1998	4	2,3,5,5	July	Hyperthermia/ Asphyxiation	90 F (32.2 C)	2
1998	2	2,5	August	Hyperthermia/ Asphyxiation	85 F (29.4 C)	5
1998	5	2,3,5,6,6	August	Hyperthermia	100 F (37.7 C)	2

\*Medical examiners/coroners provided written and verbal cause-of-death information.

+ Outside temperatures are approximated.

& Data were not available.

@ Information was available only for the 3-year-old.

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