



Retrospective Analysis of Heat Stroke Deaths of Children in Motor Vehicles

Summary

NHTSA collects information from death certificates to identify noncrash motor vehicle fatalities including heat-stroke-related deaths of children from birth to age 14 in motor vehicles. The underlying cause of death as noted on death certificates for cases in which heat stroke is suspected is not always heat-related and may explain why NHTSA counts are different from those reported by other sources.

Background

In addition to collecting motor vehicle crash data, the National Highway Traffic Safety Administration is charged with collecting noncrash and non-traffic motor vehicle data:

...[NHTSA] shall establish and maintain a database of injuries and deaths in nontraffic, noncrash events involving motor vehicles.—*Cameron Gulbransen Kids Transportation Safety Act of 2007, Public Law 110–189*

NHTSA created the Non-Traffic Surveillance system (NTS) to satisfy these requirements. It is a virtual data collection system designed to provide counts and details regarding fatalities and injuries that occur in non-traffic crashes and in noncrash incidents.

To improve the noncrash data that are being collected, a Non Crash Child Death and Injury Data Forum was held in November 2011 to develop ways that NHTSA could improve surveillance of noncrash child fatalities and injuries. One of the issues examined at the forum was child deaths from heat stroke in motor vehicles.

NHTSA publishes an average annual number of heat stroke deaths (NCSA, 2009) based on an analysis of a special mortality file from the National Vital Statistics System (NVSS) from the National Center for Health Statistics (NCHS). (NHTSA had previously determined that death certificates were the best method for collecting information about noncrash fatalities [Austin, 2008].) This analysis involved reviewing death certificate data, including reading the narratives from the death certificates to look for the involvement of motor vehicles. Independent researchers also gather statistics on heat stroke deaths based on media reports and other sources, and one of the commonly cited researchers has reported a different number of deaths from those stated by NHTSA (Null, 2013).

Forum attendees hypothesized that some of the deaths might have been coded as intentional deaths and thus would not have been included in NHTSA analyses. They recommended that NHTSA conduct a retrospective study of known heat stroke deaths by using the National Death Index (NDI) at the NCHS.

NTS Methodology

The methodology NHTSA uses when researching deaths from the NVSS involves a review of the underlying cause of death as entered on the death certificate. The underlying cause of death is defined as the disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury. When a death is the result of an external cause, an external cause of injury code is used in addition to the illness codes. This code defines both the mechanism of the event and the manner of the death. In the first step, International Classification of Diseases codes (ICD 10) are used to eliminate three types of deaths (transport, intentional, and firearm). These exclusions leave a dataset with unintentional deaths and deaths of unknown intent from external causes that were neither transport nor firearm-related. Text matching is then used on text fields from the death certificate (place of injury, injury description, narrative) to include only those deaths that may indicate the presence of a passenger motor vehicle. The resulting fields from the death certificate (sex, age, cause of death, external cause of death, place of injury, injury description, and narrative) are then reviewed to determine the type of incident.

Data Analysis

The NDI is a central computerized index of death record information on file in State vital statistics offices. It is available to investigators solely for statistical purposes in medical and health research. Names from a public website (Null, 2012) were used in this analysis. Only deaths involving passenger vehicles and not involving trunk entrapments were considered—the same conditions applied to NHTSA's data using the NVSS. Use of the NDI requires submission of an application, a fee, and the approval of an institutional review board (IRB). An independent IRB was hired by NHTSA and approval was received.

Having Social Security numbers (SSNs) increases the likelihood of identifying deaths in the NDI. For the years 2003 to 2009, we matched 150 out of 252 deaths from the researcher's

website with SSNs found using web-based social security death index search engines.

We were able to locate 147 of the 150 deaths in the NDI results. The information obtained does not include narratives from the death certificates, making it impossible to know if motor vehicles were involved.

Results

The information obtained from the NDI included the underlying cause of death and is presented below for the 147 matched deaths. The underlying cause of death included heat related codes for 108 of the deaths, or 73 percent (codes W92, X30).

Underlying Cause of Death of Media Identified Heat Stroke Deaths, 2003–2009

ICD-10 CODE	Description	Count
<i>General symptoms, no diagnosis is classifiable (EXCLUDED from NTS)</i>		
R50.9	Fever, unspecified	2
R95	Sudden infant death syndrome	1
R99	Other ill-defined and unspecified causes of mortality	6
<i>Motor vehicle crash (EXCLUDED from NTS)</i>		
V89.2	Person injured in unspecified motor-vehicle accident, traffic	2
<i>Other accidental injury (INCLUDED in NTS)</i>		
W81	Confined to or trapped in a low-oxygen environment	1
W92	Exposure to excessive heat of man-made origin	1
X30	Exposure to excessive natural heat	107
X31	Exposure to excessive natural cold	2
<i>Assault (EXCLUDED from NTS)</i>		
Y06.1	Neglect and abandonment by parent	1
Y06.9	Neglect and abandonment by unspecified person	2
Y07.9	Other maltreatment syndromes by unspecified person	2
Y08	Assault (homicide) by other specified means	14
<i>Undetermined intent (EXCLUDED from NTS)</i>		
Y33	Other specified events, undetermined intent	6

Discussion

NHTSA does not include deaths coded as intentional when identifying heat stroke deaths. The issue of the appropriateness of the use of intentional cause of death is specifically addressed by the National Association of Medical Examiners.

... the principles in this Guide suggest that ... cases be classified as accident unless there is clear evidence of intent to harm the child. Classification of such deaths as accident would not preclude legal proceedings and criminal charges if the case met legal criteria of criminal neglect, abandonment, or some other crime. (Hanzlick, Hunsacker III, & Davis, 2002)



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

Based on this analysis, if the underlying cause of death from the death certificate is not considered, an enumeration of heat stroke deaths based on other sources will differ from NHTSA's counts.

References

- Austin, R. (2008, December). NiTS 2007: Noncrash Fatality Database user's manual (Report No. DOT HS 811 065). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/811065.pdf
- Hanzlick, R., Hunsacker III, J. C., & Davis, G. J. (2002, February). A guide for manner of death classification (First edition). Marceline, MO: National Association of Medical Examiners. Available at www.charlydmiller.com/LIB03/2002NAMEmannerofdeath.pdf
- National Center for Statistics and Analysis. (2009, June). Not-in-Traffic Surveillance 2007 – Children (Traffic Safety Facts Crash Stats. Report No. DOT HS 811 116). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/811116.pdf
- Null, J. (2013). Heatstroke deaths of children in vehicles (Web page). Retrieved from the San Jose State University Department of Meteorology and Climate Science website at <http://ggweather.com/heat/> on July 5, 2013.
- Null, J. (2012). Heatstroke deaths of children in vehicles (Web page). Retrieved from the San Jose State University Department of Meteorology and Climate Science website at <http://ggweather.com/heat/> on various dates in 2012.
- Public Law 110–189, 49 U.S.C. 30102 and 30111, Cameron Gulbransen Kids Transportation Safety Act of 2007 also known as the K.T. Safety Act of 2007.

Suggested APA Citation Format for This Document:

- National Center for Statistics and Analysis. (2015, December). Analysis of heat stroke deaths of children in Motor Vehicles (Traffic Safety Facts Research Note. Report No. DOT HS 812 220). Washington, DC: National Highway Traffic Safety Administration.

This research note and other general information on highway traffic safety may be accessed by Internet users at: www-nrd.nhtsa.dot.gov/CATS/index.aspx