

# New UGA temperature table may help reduce heat-related deaths of children in closed cars

June 29 2010

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The heat of summer brings trips to the lake, afternoons at the beach and vacations in the mountains. It also arrives with the threat of dangerous conditions in closed cars, where children left alone for even a few minutes can lead to tragedy.

Now, a team of researchers at the University of Georgia has developed an easy-to-use table of [vehicle](#) temperature changes that may help public officials and media remind the public about the deadly consequences of vehicle-related hyperthermia in children.

While government agencies routinely give warnings about leaving children alone in cars in [hot weather](#), vehicle [temperature data](#) from many early studies were "often obtained with small datasets and questionable methodologies such as placing a temperature sensor directly on a car seat," according to Andrew Grundstein of UGA's department of geography in the Franklin College of Arts and Sciences and leader of the research.

"The danger of leaving young children unattended in vehicles has been well documented," said Grundstein, "But it still happens, and it's always the worst kind of tragedy. Most of the time, caregivers simply forget their children, but more than a quarter of deaths in this situation involve children intentionally left in cars. In some cases, parents just don't want to disturb a sleeping child. Such behavior shows a clear lack of understanding about the dangers of leaving children unattended in vehicles."

The research was just published in the [Bulletin of the American Meteorological Society](#). Other authors, also from UGA, are John Dowd and Vernon Meentemeyer.

Each year around 40 children die in the U.S. alone from being left in closed cars during hot weather. Many studies have shown how such things as shading, ventilation and different meteorological conditions can affect temperatures inside cars. But until now, there has been no reliable table of vehicle temperature changes.

What the researchers found was stunning.

In hot weather in an open parking lot, the inside temperature of a car can rise by 7 degrees Fahrenheit in five minutes, 13 degrees in 10 minutes, 29 degrees in 30 minutes and 47 degrees in an hour. This means interior temperatures can reach levels lethal to small children in less time than some parents might think.

One way to characterize the meaning of these temperatures in terms of a health hazard is to place them in the context of heat-health warnings provided by the National Weather Service. For example, on a 90-degree day, temperatures within the car would reach an "excessive heat advisory" in a little over 10 minutes and an "excessive heat warning" in less than 30 minutes.

To develop their table, the researchers measured air temperatures for 58 days (April 1-Aug. 31, 2007) in a metallic gray Honda with gray cloth seats parked in an open, paved parking lot with direct exposure to sunlight. To gather data, they used carefully positioned, high-temporal-resolution temperature sensors. They coupled that information with data gathered using a human thermal exchange model called the Man-Environment Heat Exchange Model (MENEX). In doing so, they were able to combine the rising temperatures inside a closed car with the way

they would interact with the so-called "human thermal budget." In the end, the team selected 14 clear days, representing the most severe possible conditions on which to base calculations for their new table.

The model simulations were performed on a "theoretical" child seated inside the car as well as one outside the car for reference.

The results were sobering.

"Not only are the children exposed to intense heating from the hot interior of the car, but within a closed vehicle without ventilation, physiological mechanisms typically used for cooling are ineffective," said Grundstein. "Furthermore, the efficiency of evaporative cooling would be reduced as evaporated perspiration accumulated in the vehicle."

All of this is not to imply in any way that government agencies have ignored the problem. The National Weather Service, for instance, issues excessive heat warnings and heat advisories to alert people when conditions outside can be dangerous because of the heat. And health agencies have warned the public for years about the dangers of leaving children in cars during hot weather.

What the new research offers is the first table of vehicle temperature changes based on precise temperature readings, coupled with the MENEX model. The result is a chart that brings home clearly just what a serious decision it is to leave a child in a closed car in hot weather even for a few minutes.

"While the deaths of children left in cars from hyperthermia is tragic, there is, of course, no reason, ever, to leave a child in a car unattended," said Grundstein. "Risks such as abduction or injury abound, as well as [children](#) being asphyxiated from entrapment by vehicle windows."

The new easy-to-use table, however, could offer government officials and health agencies a way to quantify warnings and to make real yet again to parents that leaving a child in a heated car can only be a prelude to lifelong remorse.

Provided by University of Georgia

Citation: New UGA temperature table may help reduce heat-related deaths of children in closed cars (2010, June 29) retrieved 20 April 2024 from <https://medicalxpress.com/news/2010-06-uga-temperature-table-heat-related-deaths.html>

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