

# “Good parents” denial puts kids at risk for heat stroke

Every year, US children die of heat stroke after being trapped in vehicles. The people responsible for these preventable tragedies are typically loving, well-meaning parents—none of whom believe it could happen to them.

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As children in the United States—especially vulnerable infants and toddlers—continue to die from heat stroke inside cars and other vehicles, researchers are making an astonishing discovery about *why* these preventable tragedies occur. Those responsible for killing their young aren't monsters. They're generally not even irresponsible. Rather, these are loving, well-meaning parents or caregivers who unknowingly leave children inside cars.<sup>1</sup>

In 2013, one of the worst years on record, 44 children died from heat stroke after being trapped in vehicles for hours.<sup>2</sup> More than 600 children have suffered heat stroke and died in cars since 1998, according to [Safe Kids Worldwide](#).

It's easy to pass judgment on those who seem reckless enough to leave often-tiny babies to die helplessly in a car, but experts say it can happen to anyone. Most often it's not due to recklessness, but simple forgetfulness.

Yes, parents and caregivers forget children are in their cars.



*David Diamond,  
PhD*

David Diamond, PhD, serves as an expert witness on many cases in which adults have left children in cars and children have suffered great harm or died as a result. Diamond, a professor of psychology, molecular pharmacology, and physiology at the University of South Florida, Tampa, has also researched the topic and interviewed dozens of parents who have experienced the tragedy firsthand.

“The first thing to emphasize to doctors is this happens to all kinds of people. This does not seem to target irresponsible people. It targets people who, in fact, are aware of this phenomenon. There are quite a few parents who have learned of other parents leaving kids in cars, and they judge them very harshly. Those are the very same parents who then forget their kids and their kids die,” Diamond says. “So, no one is immune from making this memory error. I tell people, if you're human and have ever forgotten anything (if you satisfy those 2 criteria), then you can forget a child in a car.”

While parents and caregivers are the first line of defense against these needless tragedies, everyone in the community has a role to play in preventing them, according to a statement by the National Highway Traffic Safety Administration (NHTSA). Pediatricians can be the key contact for educating caregivers and raising their awareness of the risks.



*Greg Gulbransen,  
MD*

“A large part of what we as pediatricians do is discuss anticipatory guidance to help make parents aware of various safety issues that families face daily. Although we have so little time to cover so many important topics, we really owe it to our families to touch on automobile safety because so many children are injured or killed in vehicles annually,” says Greg Gulbransen, MD, a pediatrician in Oyster Bay, New York, and a board member of [KidsAndCars.org](http://KidsAndCars.org). “Automobiles pose many different dangers of which heat injury, backovers, window entrapments, car seats, and seat belts are just a few of the issues that annually injure and kill many children.”

## **Dangerous disconnect**

One of the problems is many parents and caregivers don't seem to understand the gravity of connections among children, heat stroke, and vehicles. Illustrating the point, 1000 parents with children aged 6 years and younger and people who regularly transport this age group responded to a national online survey by Public Opinion Strategies of Washington, DC, between January and February 2014. The survey was conducted as part of a national heat stroke awareness online survey on behalf of [Safe Kids Worldwide](http://SafeKidsWorldwide.org).

The findings, released in April 2014, reveal nearly 7 in 10 of those surveyed have heard about the dangers of heat stroke when children are left in vehicles.<sup>2</sup> Despite this knowledge, many said they would leave their own children in vehicles. Fourteen percent of parents reported leaving a child aged 6 years or younger alone in a parked, locked car. Based on US population, that number is projected to be nearly 2 million parents transporting more than 3.3 million children.

Additionally, 11% of parents reported mistakenly leaving a vehicle parked and locked with the child inside; and 6% of parents said they were comfortable letting their young children stay in a parked, locked vehicle for longer than 15 minutes.<sup>2</sup>

Fathers seem more likely to leave kids in cars than mothers. According to the survey, 23% of fathers versus 8% of mothers reported leaving kids alone in parked cars.<sup>2</sup>

## **Incidence and the ‘why’ of risk**

Heat stroke is the second leading cause of nontraffic fatalities among US children, second only to backovers in which drivers unknowingly run over children while backing up a vehicle.<sup>3</sup> Ninety percent of the children who die of heat stroke in cars are aged 3 years and younger.<sup>2</sup>

What parents' might not understand and what pediatricians can help to explain is that little bodies heat up fast—at 3 to 5 times the rate of adults' bodies—putting children at high risk for heat stroke.<sup>4</sup> A child whose core body temperature reaches 107°F experiences cell death and organ shutdown, leading to death.<sup>5</sup>

In an observational study published in 2005 in *Pediatrics*, McLaren and colleagues measured the temperature rise in a dark sedan on 16 different clear, sunny days, ranging in temperature from 72°F to 96°F.<sup>6</sup> They also measured how cracking a window 1.5 inches might change a car's internal temperature. The study found that the rate of temperature rise inside the car was similar regardless of how hot it was outside. On average, the increase was 3.2°F every 5 minutes, and 80% of the temperature rise occurred during the first 30 minutes.

The car's ultimate temperature depended on its starting ambient temperature, but even at 72°F, the internal temperature reached 117°F.<sup>6</sup> The researchers noted that, on average, internal temperatures increased 40°F. Leaving the windows cracked open did not significantly slow the heating process or decrease the maximum temperature.

Even with outside temperatures as low as in the 60s, a car can heat up to much higher than 110°F.<sup>7</sup>

## **Anecdotal survival**

Just how many children survive harrowing hours trapped in a hot car is difficult to tell, according to Sue Auriemma, vice president of [KidsAndCars.org](http://KidsAndCars.org).



*Sue Auriemma*

“The only calculation we would be able to do in terms of what percentage of children die and what percentage are injured or unharmed would be based only on the cases that we have in our database, most of which come from media reports and hospital records,” Auriemma relates. “In reality, the likelihood is that the vast majority of ‘close calls’ don’t get reported to law enforcement or the media.”

In Diamond's experience, most children left in cars for hours at a time have died. “I’ve actually been involved in one case where the child didn’t die and suffered [permanent] brain damage as a result of being left in a car. That’s the only case I know of in which a child is forgotten and [the] child didn’t die,” Diamond notes.

That particular case occurred after a child was trapped in a car all day long in Wyoming. It was only 60°F outside, Diamond says.



**Check out this video that shows how quickly a car's internal temperature climbs to a deadly level from the sun's radiation. [ContemporaryPediatrics.com/heat-stroke-vehicle-heating](https://www.contemporarypediatrics.com/heat-stroke-vehicle-heating)**

Booth and colleagues studied 231 US children who died of hyperthermia in parked vehicles from 1999 to 2007.<sup>8</sup> They found that children were unattended in more than 80% of the cases: 25% were playing at the time of death and 60% were male. The victims' body core temperature had reached an average 107.2°F after being left inside cars and other vehicles for an average of 4.6 hours.

In the researchers' analysis, most deaths occurred in the South, followed by the West, Midwest, and Northeast.<sup>8</sup> The state of Texas led the country in child vehicular stroke deaths from 1998 to 2013, followed by Florida and California, according to the Department of Geosciences at San Francisco State University, California.<sup>5</sup> However, these deaths also occur in milder climates. For example, there were 5 such deaths among children in Washington State from 1998 to 2013.

[Physics explains why cars can become ovens.](#) The sun's short-wave radiation is absorbed by dark dashboards and seats, which can reach from 180°F to more than 200°F.<sup>5</sup> These heated objects, which include child seats, then emit long-wave radiation, which heats a vehicle's interior air.

## The cold reality

In most cases, the parents and caregivers involved in such incidents have not consumed drugs or alcohol. Most often, they are loving, caring people who simply forget they have a child in the back seat.



*Janette Fennell*

Roughly 8% of people who were responsible when a child died from heat stroke in a car have been found to be negligent, meaning there were drugs, alcohol, or a previous interaction with Child Protective Services, according to Janette Fennell, founder and president of [KidsAndCars.org](https://www.kidsandcars.org).

“I like to make the point that it’s truly the opposite of what the perception is in these tragic situations,” Fennell states. “People in their minds really want to think this happens most often to people who are drunk or [who] are not good parents, and rarely to the good parents. It’s exactly the opposite.”

Researchers who studied media reports about the 606 US child vehicular heat stroke deaths from 1998 through 2013 report that 52% of the cases—316 children—died after caregivers forgot them in the vehicle.<sup>5</sup> Nearly 30% of the children were playing in an unattended vehicle and, in 18% of cases, adults intentionally left children in their vehicles.

How could this be? Diamond says it makes sense from a neuroscientific standpoint.

It’s not that parents have some sort of global amnesia, he explains. Rather these parents tend to lose awareness that their children are in their cars. They’ll talk about their children throughout the day and even look forward to seeing them at daycare or at home after work.

“Their child is dying in the car, while they believe the child is actually at daycare. So, it’s not just forgetting—it is losing awareness that the child is in the car,” Diamond says.

## **Disrupted patterns**

Diamond and colleagues have developed a 2-part hypothesis to address what they have termed “forgotten baby syndrome” (FBS). They examined whether there is a consistent pattern of circumstances related to FBS, and then speculated on the syndrome’s neurobiological basis.

There’s a consistent pattern associated with this tragedy, relates Diamond, whose observations discount caregivers who use drugs or alcohol, as well as others who have mental illness. The problem seems to occur when parents depart from their normal habits or daily patterns. For example, a parent who doesn’t normally take his or her child to daycare, but does on that one day, is more likely to forget that child in the car, Diamond explains.

“From a neuroscientific perspective, forgetting a child is analogous to when you’re driving home from work and you intend to stop along the way just to go to the store, and you forget to go the store. You just drive home,” Diamond says.

Competing brain-memory systems are to blame, according to Diamond. The brain system at the cognitive level, processed by the hippocampus, tells us we want to go to the store, or today we’re taking baby to daycare. The competing brain memory system, controlled by the basal ganglia and motor cortex, governs motor habits.

“These motor areas compete with our cognitive areas to get us to do things without thinking about them,” Diamond says. “And, in fact, they’re so powerful that they can suppress our cognitive areas.” One example of how we sometimes operate at this basal ganglia level is this: The power goes out. There’s no power in your house or in the neighborhood. Still, you walk into a dark room and flip the light switch.

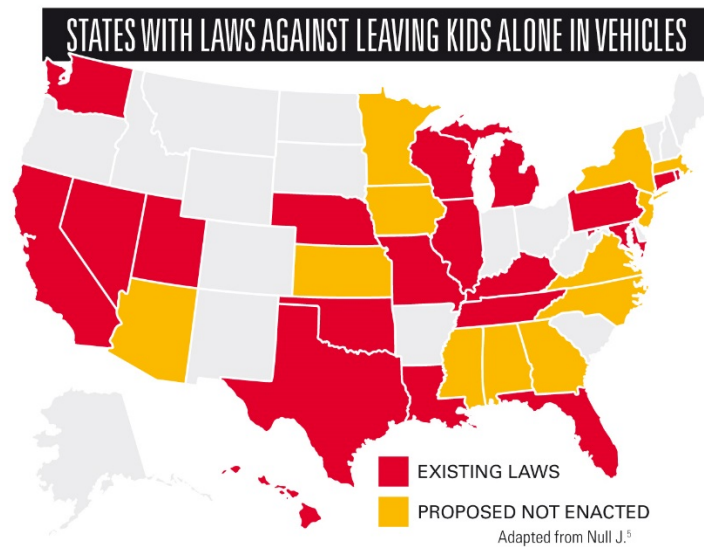
“The reason that you do that is not because you believe the light is going to come on, but because your basal ganglia gets you to do this as an automatic habit when you walk into a room,” Diamond says.

What happens over and over in these forgotten child cases, in Diamond’s experience, is that the motor system basically outcompetes the cognitive system.

## **FBS and the law**

Parents and caregivers often have more than the unimaginable guilt to deal with after these tragedies. The legal consequences for leaving children alone in vehicles vary from state to state. Twenty states have laws that specifically address leaving a child unattended in a vehicle (see "States with laws against leaving kids alone in vehicles").<sup>5</sup> Some states consider it a felony if a child is harmed or dies as a result of being left in a car.<sup>7</sup>

Prosecutions often follow—even absent substance use or other negligent behavior by the adult involved. "Many parents are charged even though there was no intent—no drug or alcohol use or obvious neglect on the part of the parent," according to Auriemma.



## Advice to pediatricians

The first thing all people who drive children to any destination should do is to accept that they are capable of forgetting a child in the car, Diamond states flatly.

"I think it's actually good for a doctor to recommend people to dwell on this, that it actually happens with regularity," Diamond emphasizes. "It happens on average about once a week across the country, from the spring into the fall, and that's just when it's warm enough for kids to die. As long as it's at least 60°F to 70°F outside, a car can get hot enough to kill a child."

# RESOURCES FOR PEDIATRICIANS

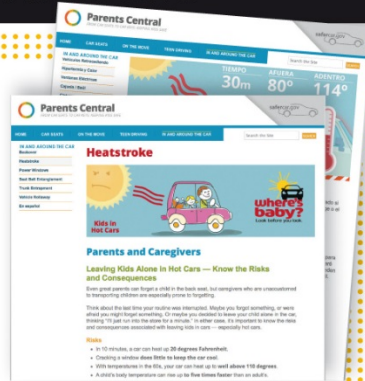
Print out these educational handouts to give to caregivers on the risks and consequences of leaving a child in a hot car:

**In English:**

[www.safercar.gov/parents/heatstroke.htm](http://www.safercar.gov/parents/heatstroke.htm)

**In Spanish:**

[www.safercar.gov/parents/hipertermia.htm](http://www.safercar.gov/parents/hipertermia.htm)



Some parents might take offense at a pediatrician's suggestion that they could forget their child in a car. If this is the case, Diamond counsels, one can phrase it another way. Instead, suggest the parent could lose awareness the child is in the car.

Next, pediatricians should stress to parents and transporters of children that it is when they get out of their regular habits that they are at high risk for forgetting children, and they should employ physical objects as reminders in the car. Diamond recommends drivers put something that belongs to the child in the front seat, as a memory cue.

Parents should also consider moving the child's car seat to the middle of the back seat, or directly behind the passenger side, so that the driver can better see the child.

Another common problem for which pediatricians can raise caregivers' awareness, Diamond says, is that parents who experience this tragedy often are sleep deprived.

"Having an infant almost means by definition that you're going to be sleep deprived," he says. "When people are sleep deprived, they're more likely to have activation of their brain habit system than their cognitive system. Pediatricians are going to see people who are sleep deprived—who are really stressed out—and if the pediatrician can convey to them that that's when they're in a state in which they're more likely to forget a child in a car, that's beneficial."

## Advocate for policy change

[KidsAndCars.org](http://KidsAndCars.org) lobbied to have incorporated as part of the reauthorization of NHTSA a provision that could help prevent these inadvertent deaths. The provision would mandate equipping vehicles with sensors to detect the presence of a child in the back seat of a car or sound a warning when a child is left inside should the driver's memory fail. Similar automobile warning features currently remind drivers when they have left the key in the ignition or left the headlights on.

Other aftermarket technologies and gadgets (see "Tech tools that might save a child") are available that can alert caregivers to a forgotten child. Ironically, marketing them has been a challenge for their inventors for the very same reason these tragedies occur in the first place: parents' denial that they themselves would ever forget their child.

## TECH TOOLS THAT MIGHT SAVE A CHILD

These helpful technologies might help remind parents that kids are in the car.

### **First Years True Fit iAlert**

The smartphone application works with the First Years True Fit iAlert Convertible Car Seat to alert parents or caregivers of potentially unsafe situations. Key features of the iAlert app include:

- Assists in achieving the correct angle position when installing in rear-facing mode.
- Reminds user to check the car seat buckle.
- Alerts user if child is out of his/her car seat while you are driving.
- Alerts user if child is left unattended in his/her car seat.
- Constantly monitors the ambient temperature in the car.
- Allows user to set up emergency contacts.

<http://thefirstyears.com/ialert>



### **Halo Baby Seat Safety System**

This car seat pad fits most standard car seats for infants through toddlers and works with the HALO key fob monitor. The system is activated whenever a baby is placed in the car seat. If a baby is accidentally forgotten, or if the vehicle becomes dangerously hot or cold, the key fob will sound a reminder. If the baby is not quickly returned to a safe condition, the car seat pad itself will sound an alarm to alert anyone in the immediate area to the fact that a baby is in danger and needs assistance.

[http://sistersofinvention.com/child\\_products/readch.html](http://sistersofinvention.com/child_products/readch.html)

“Most parents do not believe that they could inadvertently leave a child behind in the vehicle. Therefore, most parents would not purchase the technology because they don’t feel that it is something they need,” says Auriemma.

“Sadly, we have lost 5 children so far this year,” she adds, “Most of them in the past few weeks. Three children were inadvertently left behind and 2 others were able to gain access to the vehicle and unable to escape.”

## REFERENCES

1. Child vehicular heat stroke summary. KidsAndCars.org web site. <http://www.kidsandcars.org/userfiles/dangers/heat-stroke-fact-sheet.pdf>. Published August 15, 2012. Accessed May 22, 2014.
2. New study: 14% of parents say they have left a child alone inside parked vehicle despite the risks of heatstroke [press release]. Washington, DC: Safe Kids Worldwide; April 29, 2014. <http://www.safekids.org/press-release/new-study-14-parents-say-they-have-left-child-alone-inside-parked-vehicle-despite>. Accessed May 22, 2014.
3. National statistics. KidsAndCars.org web site. <http://www.KidsAndCars.org/statistics.html>. Accessed May 22, 2014.
4. 14% of parents have left a child alone inside parked vehicle [news release]. Health, medical, and science updates. Stoneheartnewsletters web site. <http://www.stoneheartnewsletters.com/14-of-parents-say-they-have-left-a-child-alone-inside-parked-vehicle/updates/>. Published April 30, 2014. Accessed May 22, 2014.
5. Null J. Heatstroke deaths of children in vehicles. Department of Earth and Climate Sciences. San Francisco State University, web site. <http://ggweather.com/heat/>. Updated May 20, 2014. Accessed May 22, 2014.



6. McLaren C, Null J, Quinn J. Heat stress from enclosed vehicles: moderate ambient temperatures cause significant temperature rise in enclosed vehicles. *Pediatrics*. 2005;116(1):e109-e112.
  7. Heatstroke. Parents and caregivers: Leaving kids alone in hot cars—know the risks and consequences. Safercar.gov web site. <http://www.safercar.gov/parents/heatstroke.htm>. Accessed May 22, 2014.
  8. Booth JN III, Davis GG, Waterbor J, McGwin G Jr. Hyperthermia deaths among children in parked vehicles: an analysis of 231 fatalities in the United States, 1999–2007. *Forensic Sci Med Pathol*. 2010;6:99-105. Available at:<http://www.KidsAndCars.org/userfiles/dangers/heat-stroke/studies/2010-06-hyperthermia-deaths-among-children.pdf>. Published March 4, 2010. Accessed May 22, 2014.
  9. National Highway Traffic Safety Administration. NHTSA urges parents and caregivers to think “Where’s Baby: Look Before You Lock.”<http://www.nhtsa.gov/About+NHTSA/Press+Releases/2014/NHTSA+urges+parents+and+caregivers+to+think+Where's+Baby,+Look+Before+You+Lock>. Published May 6, 2014. Accessed May 22, 2014.
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## **Where’s Baby? Alerts to teach parents and caregivers**

The National Highway Traffic Safety Administration (NHTSA), Safe Kids Worldwide, and their safety partners recommend that people transporting children take these steps:

- Never leave children alone in or around cars, not even for a minute.
- Put something you’ll need such as your cell phone, handbag, employee ID, or briefcase on the floorboard in the back seat.
- Get in the habit of always opening the back door of your vehicle every time you reach your destination to make sure no child has been left behind. This will soon become a habit. NHTSA calls this the “Look Before You Lock” campaign.
- Keep a large stuffed animal in the child’s car seat when it’s not occupied. When the child is placed in the seat, put the stuffed animal in the front passenger seat. It’s a visual reminder that any time the stuffed animal is up front, you know the child is in the back seat in a child safety seat.
- Make arrangements with your child’s daycare center or babysitter that you will always call if your child will not be there on a particular day as scheduled.
- Keep vehicles locked at all times, even in the garage or driveway, and always set your parking brake.
- Keys and/or remote openers should never be left within reach of children.
- Make sure all child passengers have left the vehicle after it is parked.
- When a child is missing, check vehicles and car trunks immediately.
- If you see a child alone in a vehicle, get involved. If the child looks hot or appears to be sick, get the child out as quickly as possible. Call 911 or your local emergency number immediately.
- Be especially careful about keeping children safe in and around cars during busy times, schedule changes, and periods of crisis or holidays.
- Use drive through services when available (e.g., restaurants, banks, pharmacies, dry cleaners).
- Use a debit or credit card to pay for gas at the pump.

National Highway Traffic Safety Administration.<sup>9</sup>

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## ACT for Safety

Safe Kids Worldwide recommends that caregivers use the acronym **ACT** as a safety reminder:

**A:** Avoid heat stroke-related injury and death by never leaving your child alone in a car, not even for a minute. Also, make sure to keep your car locked when you're not in it so kids don't get in on their own.

**C:** Create reminders by putting something on the back seat of your car next to your child such as a briefcase, a purse, or a cell phone that is needed at your final destination. This is especially important if you're not following your normal routine.

**T:** Take action. If you see a child alone in a car, call 911.

Safe Kids Worldwide.<sup>2</sup>

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## Heat stroke awareness tools for healthcare providers

As a healthcare professional, you're in a great position to make a big difference in your area. Help prevent heat stroke in children by knowing and sharing the facts with your patients' caregivers, your staff, and your community.

*Heat stroke safety tips:*

PDF: [ContemporaryPediatrics.com/heat-stroke-tips-PDF](http://ContemporaryPediatrics.com/heat-stroke-tips-PDF)

HTML: [ContemporaryPediatrics.com/heat-stroke-tips-HTML](http://ContemporaryPediatrics.com/heat-stroke-tips-HTML)

*Frequently asked questions:*

[ContemporaryPediatrics.com/heat-stroke-FAQ](http://ContemporaryPediatrics.com/heat-stroke-FAQ)

*Social media guide:*

[ContemporaryPediatrics.com/heat-stroke-social-media-guide](http://ContemporaryPediatrics.com/heat-stroke-social-media-guide)

*Poster:* [ContemporaryPediatrics.com/heat-stroke-poster](http://ContemporaryPediatrics.com/heat-stroke-poster)

*Print ad:* [ContemporaryPediatrics.com/heat-stroke-print-ad](http://ContemporaryPediatrics.com/heat-stroke-print-ad)

*Sample press release:*

[ContemporaryPediatrics.com/heat-stroke-press-release](http://ContemporaryPediatrics.com/heat-stroke-press-release)

See more at: [www.safekids.org/take-action-prevent-heatstroke](http://www.safekids.org/take-action-prevent-heatstroke)

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## The "Where's Baby? Look Before You Lock" Campaign

Beginning May 5 through September 2014, the US Department of Transportation's National Highway Traffic Safety Administration is launching a national radio and Internet campaign, "Where's Baby? Look Before You Lock," to teach parents, caregivers, and grandparents about the dangers of leaving children in cars.

[ContemporaryPediatrics.com/heat-stroke-where-s-baby](http://ContemporaryPediatrics.com/heat-stroke-where-s-baby)

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## For caregivers and daycare providers

"Ray Ray's Pledge" is a program between parents and teachers in which daycare providers vow to alert parents if their child does not arrive on time at daycare. (Morning drop-offs are a high-risk time of day for vehicular heat stroke tragedies to begin.)

[ContemporaryPediatrics.com/heat-stroke-Ray-Ray-pledge](http://ContemporaryPediatrics.com/heat-stroke-Ray-Ray-pledge)

Read firsthand stories of families who have lost a child to heat stroke in a vehicle, plus additional statistics, studies, technologies, and more ways to keep children safe in and around vehicles.

[www.kidsandcars.org/heatstroke.html](http://www.kidsandcars.org/heatstroke.html)

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Ms. Hilton is a medical writer in Boca Raton, Florida. She has nothing to disclose in regard to affiliations with or financial interests in any organizations that may have an interest in any part of this article.

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