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In the News

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For Children in Car Crashes, Geography Can Be Deadly

By Christina Frangou

Boston—For a child involved in a vehicular accident, location can be fatal.

Children die from motor vehicle collisions (MVC) at rates that differ dramatically around the United States, with marked differences even between neighboring counties in the same state, according to research presented at the 2018 Clinical Congress of the American College of Surgeons.

For counties with at least 100,000 children, MVC-related mortality rates were as low as 0.14 deaths per 100,000 in Fairfax, Va., and reached 2.5 deaths per 100,000 in Jefferson, Ala.

One pattern was consistent throughout the country: Children involved in car accidents in rural areas died at far higher rates than those in urban centers. The majority of MVC-related child deaths occurred in rural counties, with a risk that was four times higher than in central metropolitan areas.



Only 14% of children involved in MVC live in rural areas, but they accounted for 42% of MVC-related pediatric deaths. Although 56% of children in MVC live in central metropolitan areas, they comprised only 25% of the total MVC-related deaths.

“Rural counties were associated with increased mortality, increased response times and an increased percentage of prehospital deaths,” said Ali A. Mokdad, MD, MS, lead author of the study and a surgical resident at the University of Texas Southwestern Medical Center in Dallas.

Previous studies found that geography matters in pediatric trauma, but this study is the first to show substantial differences even within states. A county in Arizona with a population of nearly 150,000 had an estimated annual MVC death rate exceeding 4.5 per 100,000 children. The county directly west, with nearly the same number of residents, had an annual MVC death rate between 0 and 1 per 100,000 children.

Similar patterns were shown across the country. In a colored map of the United States depicting county-specific MVC deaths per 100,000 children, a checkerboard pattern nationwide demonstrated wide swings even within states. Many states included counties with low mortality rates, at 0 to 1 death per 100,000, and counties with mortality rates of 4 or higher.

“This is not surprising, but it is really important. You actually see very clearly the difference in rural areas,” said Barbara Gaines, MD, a professor of surgery at the University of Pittsburgh School of Medicine, and the director of trauma and injury prevention at UPMC Children’s Hospital.

Researchers studied deaths caused by MVC in the Fatality Analysis Reporting System (FARS) for 2010 to 2015. FARS is a national database created by National Highway Traffic Safety Administration to provide an overall measure of traffic safety. It also suggests ways to reduce fatalities from traffic accidents, and assesses the effectiveness of motor vehicle safety standards and highway safety programs.

Of 4,952 children killed in MVC during the study period, 53% died before arrival at hospital. Nearly all of these prehospital deaths occurred at the scene of the accident. The children were 7 years old on average, with a range of 0 to 14 years.

The overall average mortality rate was 1.6 deaths per 100,000 children. Counties in the 10th percentile had an average of 0.8 deaths per 100,000, whereas counties in the 90th percentile experienced 4.5 deaths per 100,000.

High mortality rates from MVC—exceeding 4.5 deaths per 100,000 children—occurred in Arizona, New Mexico and Texas.

Similar to studies of adult MVC mortality, proximity to a trauma center (adult or pediatric) was a significant factor in a child's risk for death. Compared with counties that lacked trauma centers, those with an adult trauma center had a reduced risk for death, with an odds ratio of 0.4. In counties with a pediatric trauma center, the odds ratio decreased further to 0.3.

The time required to transport victims to the hospital was strongly associated with mortality. Victims in small to medium metropolitan areas required 1.3 additional minutes to get to the hospital compared with larger centers. In rural areas, four extra minutes were needed to get to the hospital. The risk for death rose with each minute of delay in response time.

Experts in pediatric trauma said the study highlights important gaps between children in rural and urban areas, but the problem is more complex than distance from a trauma center.

“This is a really big problem and this study touches on the end result of the problem. It doesn't look at the root of the problem and all of the things that go into the care of an individual child in a county that's underserved,” said Mary Fallat, MD, Hirikati S. Nagaraj Professor of Surgery at the University of Louisville and surgeon-in-chief at Norton Children's Hospital, both in Kentucky.

Compared with cities, rural roads are in worse condition or often run through more treacherous terrain. Rural counties have fewer ambulances and less access to emergency medical services. Rural areas lack reliable cellphone or internet connectivity.

When a car accident occurs, it might not be discovered until the next car comes across it. When an injured child is transported to the nearest emergency center, it is less likely to be experienced in child trauma.

Dr. Gaines said all hospitals and surgeons should make sure their emergency departments are prepared to care for children. She and Dr. Fallat recommended that the staff of emergency departments complete the Pediatric Readiness Assessment to identify gaps and begin process improvement (<https://emscimprovement.center/projects/pediatricreadiness/>).

“Most children who are injured are going to be taken care of, at least for their initial assessment and resuscitation, at a center where it is not the primary mission to take care of kids,” Dr. Gaines said. “So institutions need to be pediatric-ready, and the providers at those institutions must maintain and seek out some level of information about the evaluation and resuscitation of kids.”

Telemedicine may help improve outcomes for kids injured in car collisions, she said.

This study included children 15 years of age or younger, thus excluding the majority of teenaged drivers involved in MVC.

FARS collects data on the date and time, and the exact location by latitude and longitude, of every automotive collision that resulted in a fatality within 30 days. Data include weather conditions; the nature of the collision; the sequence of events leading up to the accident; and the site of the accident, be it on a roadway or shoulder, along the median or at the roadside.

A 2017 study of pediatric deaths from MVC was the first of its kind to evaluate differences in mortality from state to state. Data from this study identified child safety regulations that could reduce high regional annual mortality rates following car accidents (*J Pediatr* 2017;187:295-302.e3).

The study showed that the majority of children involved in a fatal crash lived in the South (52%), followed by the West (21%), the Midwest (19%) and the Northeast (7.5%).

Investigators found that in places with higher pediatric mortality rates, residents were more likely to not use or misuse restraints or to use rural roads. The only policy-specific variable that was significant was red-light cameras; there was a higher risk for death in states without legislation regarding red-light cameras.

In a March 2017 report on pediatric trauma centers, the U.S. Government Accountability Office estimated that 57% of the 73.7 million children in the country between 2011 and 2015 lived within 30 miles of a pediatric trauma center (www.gao.gov/products/GAO-17-334).

