



Research Note

Moving Children from the Front Seat to the Back Seat: The Influence of Child Safety Campaigns

John Kindelberger and Marc Starnes*

Since 1995, many child safety campaigns have encouraged drivers to move children from the front seat to the safer back seat. NHTSA's National Center for Statistics and Analysis (NCSA) recently completed an evaluation of the effectiveness of these campaigns. This research note provides details of this analysis, which show that these programs seem to be working and have yielded numerous positive results.

Motor vehicle crashes are the single leading cause of death of American children in the age group of 4-15 years, and a major cause of death in children age three and under¹. Research has shown that children aged 12 and under are 26 to 35 percent less likely to be fatally injured in a crash if they are in the rear seat, and front seats are even less safe when equipped with an air bag which, when deployed, can harm younger children^{2,3}.

When frontal air bags came into common use in the mid-1990s, the added risk to children became a subject of concern after a number of air bag-related fatalities occurred. In response, the National Highway Traffic Safety Administration (NHTSA) and a network of partners conducted campaigns encouraging drivers to move children of age 12 and under from the front seat into the back seat (for this note, "back seat" refers to any of the second or further seats).

Child Safety Campaign Efforts

NHTSA and its private and public partners (manufacturers, insurance companies and other organizations) have committed a high volume of public education resources in an effort to prevent air bag related injuries and fatalities, especially

to children. The 1996 implementation of NHTSA's Buckle Up America Campaign and the National Safety Council's Airbag and Seat Belt Safety Campaign, as well as others, stressed the following safety principles:

- *Always buckle your safety belt.*
- *Never place a rear-facing infant seat in front of an air bag.*
- *Keep approximately 10 inches between your breastbone and the air bag.*
- *Place children in the back seat and make sure they are properly restrained in an appropriate child safety seat, or, if they are old enough, with lap and shoulder belts.*

In addition, NHTSA regulatory actions have resulted in warning labels being prominently displayed in all vehicles equipped with passenger air bags.

Existing Indicators

This note will concentrate on State crash data, but some other existing data can also provide hints of campaign effects. For instance, child fatalities attributed to a deploying front passenger air bag can be expected to drop as children move to the back seat. As of October 1, 2003, NCSA's Special Crash Investigations (SCI) program had confirmed 145 air bag-related fatal injuries to children 12 and under; of these, 123 took place from 1993 through 1999. The rate of passenger air bag related child fatalities per million registered vehicle years (MRVY) peaked at 0.8 deaths per MRVY in the 12-month period from September 1995 through August 1996. Since then, the 12-month rate has steadily fallen. It has been under .07 deaths per MRVY since 2001⁴.

Another indicator is NHTSA's National Occupant Protection Use Survey (NOPUS), a probability-based observational survey of restraint use on the nation's roads. NOPUS estimated in 2002 that 15 percent of infants, 10 percent of 1-3 year olds, and 29 percent of 4-7 years olds were in the front seat⁵. The 2002 NOPUS was the first to record seating position by age, so comparisons with earlier years are not available. The NOPUS results are also not segmented to control for certain potential variables of interest, such as number of occupants in the vehicle or air bag presence.

Methodology

State Data Eligibility Requirements

To build on the findings of the SCI teams and the NOPUS, NCSA turned to its State Data System. Since the early 1980s, NHTSA/NCSA has been obtaining computer data files coded from police crash reports in various States. NHTSA refers to this collection of crash data files as the State Data System (SDS). As of this note's publishing date, the participating States are: *California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, New Mexico, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Utah, Virginia, Washington and Wisconsin.*

The SDS records data from *all* police-reported crashes in the participating States, and so is a strong candidate for studying seating position patterns among crash-involved passengers. However, not all participating States can be used in such a study, since not all States collect comparable crash data. For this note, study needs required using States that (1) collect data (including seating position) on all vehicle occupants, including uninjured occupants; (2) record the Vehicle Identification Number (VIN); and (3) have essentially complete data available in the relevant variables for the years 1995-2001. Requirement (2) was imposed because VINs can be used to distinguish multi-seat passenger cars, sport utility vehicles, and passenger vans from vehicles where front/back seating choice is not an issue, such as pickups, buses, large trucks, two-seater sports cars, and

so on. VINs can also identify the existence of driver and/or passenger air bags in the vehicle. Requirements (1) and (3) ensure that the relevant variables are present over a useful time span.

The SDS States that met the above criteria as of July 2003 were Florida, Maryland and Utah. Coincidentally, the three viable States are in three different regions of the United States. Although they cannot statistically claim to represent the Nation, the patterns of child positioning seen within each of the three States over the years were remarkably similar to each other (and to other examined States that partially met the viability criteria). Crash data from Florida (FL), Maryland (MD) and Utah (UT) – combined – are thus studied in this note as an indicator of reactions to the child safety campaigns.

Case Selection Criteria

NCSA classified children into the age groups of 3 years and under (infants/toddlers), 4-7 (booster seat age) and 8-12 (older children). Most passenger cars, sport utility vehicles and vans were defined as eligible for this study, but two-seaters, pick-ups and other off-topic vehicles were excluded. The analysis covers the years 1995 through 2001 and includes 227,029 children in Florida, 81,532 in Maryland and 55,018 in Utah.

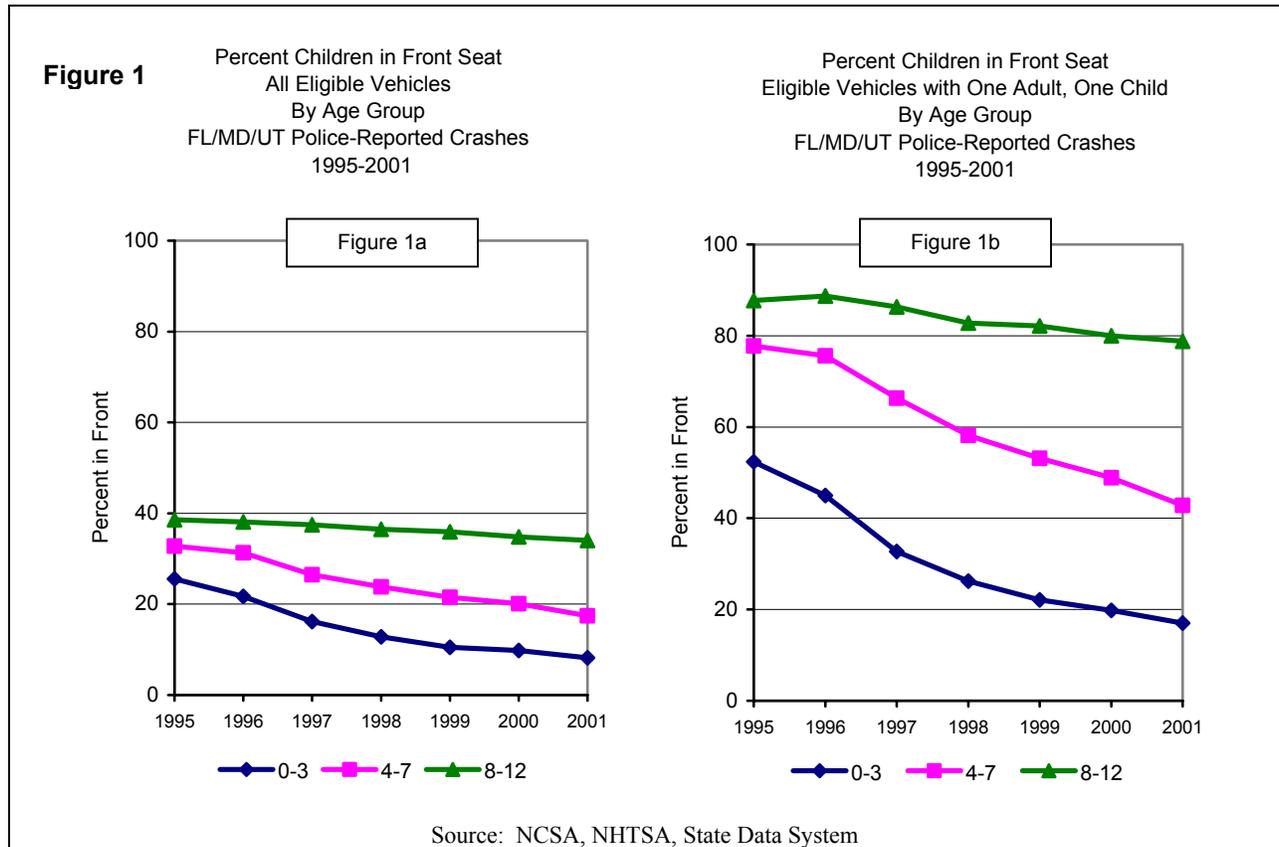
This report first examined the percentages of children in the front seat. These percentages apply to all eligible vehicles and do not control for the number of occupants per vehicle. Therefore the results include cases where the child positioning was conditioned on the number of adults or other children in the vehicle. For example, a child may be seated in the back seat only because the front seat was taken.

To control for such confounding, a second analysis was performed admitting only vehicles with exactly one adult and exactly one child (a "pair-populated" vehicle). The intent was to examine cases where *the driver had a clear choice about where to put the child.* The restricted analysis, again covering 1995-2001, includes 57,598 adult/child pairs in Florida, 19,185 in Maryland and 11,142 in Utah.

Results

In the combined three States, 25.6 percent of crash-involved children 3 years of age or younger were in the front seat in the year 1995. In 2001, the proportion had dropped to 8.2

percent. In the same years, the percent of children ages 4-7 in the front seat went from 33 percent to 19 percent, while children of ages 8-12 went from 39 percent to 35 percent. These percentages are displayed in Figure 1a.



The annual proportions of pair-populated vehicles with a child in front are shown in Figure 1b. Comparing Figures 1a and 1b points out that when a child is the only passenger (1b), a driver is more likely to seat the child in front than Figure 1a might imply. However, Figure 1b shows that tendency dropping considerably over the years.

Among the adult-child pairs, the percentage of children ages 0-3 seated in front dropped from 52 percent in 1995 to 17 percent in 2001, a decrease of 35 percentage points. The 4-7 group also dropped 35 percentage points (from 78 percent to 43 percent) but as of 2001 they are still 2.5 times more likely to be placed in the front seat (43 percent) than their younger counterparts (17 percent). The 8-12 group showed far less improvement (88 percent in

1995 to 79 percent in 2001) than their younger counterparts.

Still, Figures 1a and 1b both suggest that the child safety campaigns have had a positive influence. The percentage of children placed in the front seat decreased between 1996 and 1997, especially for younger children, and continued to drop every year through 2001. The steepest annual drops within the two younger age categories can be seen between 1996 (the implementation of the safety campaigns) and 1997. The likelihood of drivers placing a child passenger in the front seat continued to drop in each subsequent year following the campaigns. The increasing public awareness reflected in these figures can likely be attributed to the safety campaigns along with means such as media attention and word-of-mouth.

Despite the downward trends, the rates suggest that some drivers still have not adopted the safety principles. Even as recently as 2001, almost 20 percent of crash-involved drivers in the three States who were paired with a child of age 0-3 chose to place that child in the front seat. If the child was in the age range of 4-7, drivers were over 40 percent likely to seat the child in the front seat. For a child age 8-12, the front seat was chosen almost 80 percent of the time in 2001, and this is not a large reduction from the 88 percent rate seen in the year 1995.

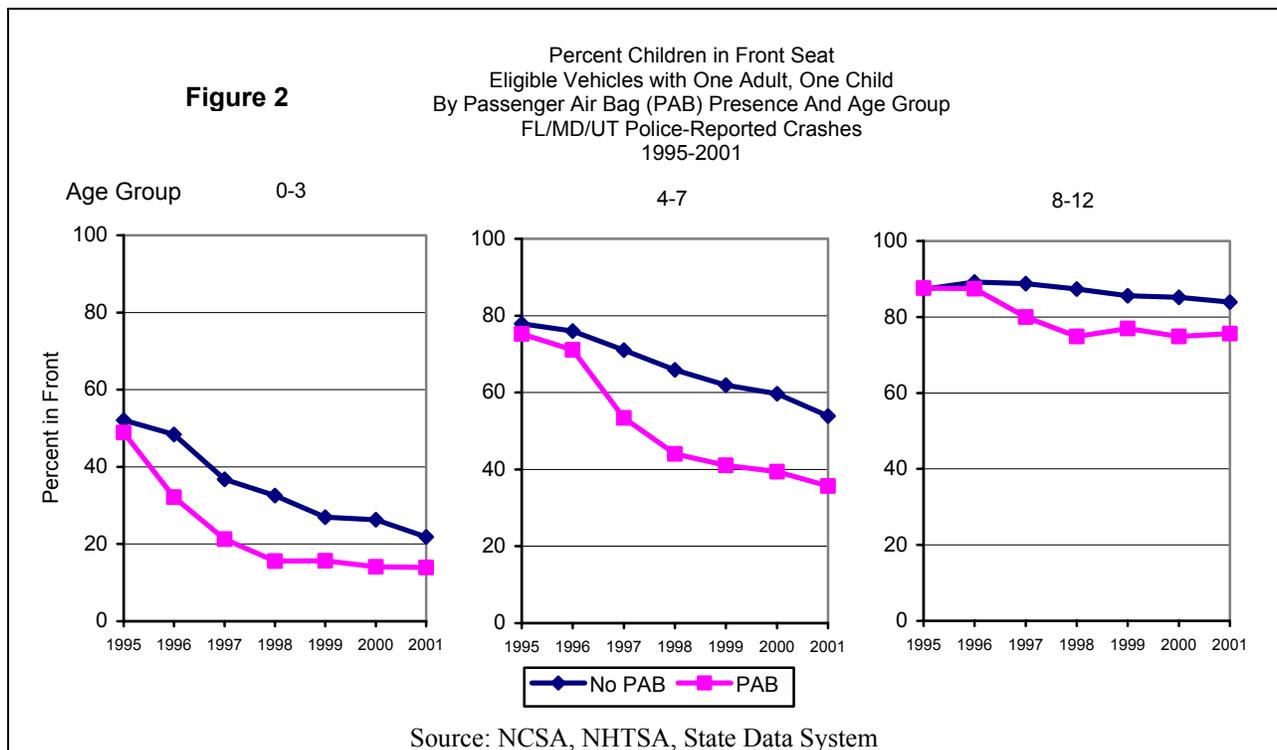
Seat Position by Air Bag Presence

A major motivation for the safety campaigns of the mid-1990s was the risk posed to a child seated in front of a deploying air bag. Still, the back seats are generally considered safer for any age, front air bag or not. Figures 1a and 1b cannot tell us whether the improvements shown are due to air bag concerns or to awareness of

the general increased safety for children in the back seat.

For a look at that issue, the adult/child pairs were further tallied by passenger air bag presence (determined by VIN). Figure 2 shows the results by age group. In 1995, passenger air bag presence made virtually no difference in a driver's choice of child placement. From 1996 through 1998, drivers of vehicles with passenger air bags shifted a larger percentage of children out of the front seat than did drivers of vehicles with no passenger air bag.

In all subsequent years, drivers were more likely to put a child in the back seat if a passenger air bag was present in the vehicle. Much less of a shift was seen among child passengers ages 8-12, but children of this age group are still more likely to be placed in the back seat if the vehicle has a passenger air bag.



Seat Position and Restraint Use

Child restraint use for surviving children in the SDS is determined by police reports and may be over-reported, so the SDS is not recommended for estimating restraint use in any given year. Due to this limitation, this note focuses on

relative shifts in restraint use over time and the differences in restraint use between the three age categories. State categorizations of restraint use are not necessarily consistent, so aggregating restraint use data over three States limited the stratification of restraint use to “restrained” and “unrestrained.”

Among the adult/child pairs in 2001, the percent of children in the front seat who were restrained was typically similar to the percent of children in the back seat who were restrained. Among 4-7 year-olds and 8-12 year-olds, over 90 percent of children in both the front seat and back seat were reported as restrained. A difference in restraint use in the front seat versus the back seat was seen among children 0-3 years old. Only 81 percent of 0-3 year olds in the front seat were reported as restrained, as compared to 94 percent in the back seat.

This pattern among children 0-3 years old may be explained by stratifying the children into six categories, based on age (0-3, 4-7, 8-12) and seating position (front seat versus back seat). From 1995 through 2001, only one of these six age-seat position categories had an increasing percentage of children who were traveling unrestrained. As seen in Figure 3, the percentage of 0-3 year old children in the front seat who were unrestrained rose from 8 percent in 1995 to 14 percent in 2001. The other five age-seat position categories had a decreasing percentage of children who were traveling unrestrained. The largest drop occurred among children 8-12 years old in the back seat (not graphed), where the percentage of unrestrained children dropped from 20 percent to 7 percent.

This trend may be attributable to the hypothesis that many safety-conscious parents moved their restrained infants and toddlers from the front seat to the back seat, as suggested by the safety campaigns. This repositioning may have led to the increased percentage of 0-3 year olds who remained unrestrained in the front seat, despite the large drop in the total number of 0-3 year old children in the front seat.

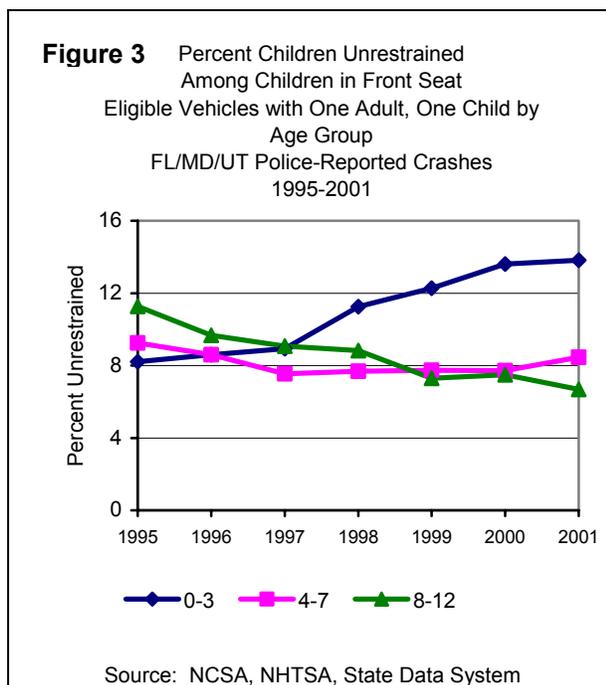
The percent of 0-3 year olds who were restrained and seated in the back seat rose from 45 percent in 1995 to 78 percent in 2001, an increase of 33 percentage points. An increase of 33 percentage points was also seen among children age 4-7 years old from 1995 (19 percent) to 2001 (52 percent). Many fewer children age 8-12 years old were restrained and seated in the back seat, rising from 10 percent in 1995 to 19 percent in 2001.

Limitations

The SDS is based on police crash reports and is only as accurate as the information provided to police officers. Safety belt use in particular may be subject to witness embellishment due to State safety belt laws. (Child positioning is not likely to be misrepresented since in the three analysis States, laws are not broken if a child is in the front seat.) Data collection and formulation procedures may vary by State.

As mentioned previously, the analysis States were used because they were the SDS States that met the study needs. Florida accounted for approximately two thirds of the analyzed cases. National seating patterns may or may not be similar to patterns seen within the three analysis States, but similar distributions were found among other States that partially met the selection criteria.

Occupants of unknown age or unknown seating position were excluded from the analyses. Seating positions among crash-involved passengers may or may not be similar to those among the general population.



Conclusions

This analysis of data from NHTSA's State Data System showed that for every year since 1995, more children have been placed in the back seat, indicating positive effects of child safety campaigns.

Other noteworthy results are:

- Drivers are more likely to place a child in the front seat if there are no other passengers in the vehicle.
- The tendency of a driver to allow children in the front seat increases with the age of the child.

- Drivers of vehicles equipped with passenger air bags have shown a greater tendency to move children to the back seat than drivers of vehicles without air bags.
- Those infants and toddlers who are still being placed in the front seat are also being left unrestrained at a greater rate than their counterparts in the back seat.

NHTSA will continue to report on this issue as new data become available.

*John Kindelberger and Marc Starnes are Mathematical Statisticians with the Mathematical Analysis Division of the National Center for Statistics and Analysis, NHTSA.

References

¹Subramanian, Rajesh: "Motor Vehicle Crashes as a Leading Cause of Death in the United States", NHTSA Research Note, DOT HS 80 661, November 2003

²Hertz, Ellen: "Revised Estimates of Child Restraint Effectiveness", NHTSA Research Note, November 1996

³Graham, John, et al.: Reducing Risks to Children in Vehicles With Passenger Airbags. Pediatrics. 1998; 102(1):e3

⁴National Center for Statistics and Analysis: "Monthly Counts for Air Bag Related Fatalities and Seriously Injured Persons", October 2003; <http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/sci.html>

⁵Glassbrenner, Donna: "The Use of Child Restraints in 2002", NHTSA Research Note, DOT HS 809 555, February 2003

Acknowledgments and thanks are due to Rajesh Subramanian of NCSA for aid in VIN decoding.

For additional copies of this research note, please call 1-800-934-8517 or fax your request to 202-366-3189. For questions regarding the data reported in this research, contact John Kindelberger (202-366-3365) or Marc Starnes (202-366-0183). This research note and other general information on highway traffic safety may be accessed by internet users at: <http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/AvailInf.html>

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**
400 Seventh Street, S.W., NPO-120
Washington, D.C. 20590

