CHILD RESTRAINT INFORMATION IN THE NATIONAL AUTOMOTIVE SAMPLING SYSTEM CRASHWORTHINESS DATA SYSTEM

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ABSTRACT

This paper will present a summary of child seat data in crashes. Use patterns between front and rear seats by child seat type are presented. Reductions in injury level is shown by the proper use of child seats.

INTRODUCTION

Since 1988, the National Automotive Sampling System (NASS) Crashworthiness Data System (CDS) has collected information on the use of child restraints in towed light vehicles involved in crashes. Nine years of child restraint data are available on 1,396 crashes involving 1,801 child restraints in 1,420 towed light vehicles. This represents approximately 705,000 crashes involving 810,000 child restraints in 723,000 towed light vehicles.

The children in child seats in the NASS CDS are 9 years old and under and weigh 29 kgs. or less. The total NASS CDS crash involved child population in this age/weight range over the years 1988-1996 is 3,738,000. Approximately 20% of these children are in child seats, 30% are restrained by a seat belt alone, and 50% have either no restraint use or the restraint use is unknown.

This paper presents a study of the involvement of child safety seats in towed light vehicles (car, light truck, or van) involved in a police reported crash. All of the analysis that follows is based solely upon this data. The presence of seats and how they are being used is only representative for the police reported tow away crashes indicated, not the vehicle-in-use population at large.

Information available for study includes the make and the type of seat (infant, toddler, booster, etc.); the proper and improper use of manual and automatic belts with the seats; the orientation of the child seats; and the presence of, addition of, and use or non-use of a harness, tether, or shield with the seat.

Child Seat Types In Use

The type of child seat is not known for a large number of vehicles because the seat cannot be viewed or the child seat owner cannot sufficiently describe it for a correct classification to be made.

Seats are classified as infant, toddler, convertible, and booster. An infant seat is designed to only face the rear of the vehicle and has a maximum capacity of 8-9 kgs. A toddler seat is designed to only face the front of the vehicle and to carry a child weighing approximately 9-23 kgs. A convertible seat is designed to face the front or rear of the vehicle and to carry a child ranging from birth to approximately 23 kgs. A booster seat is designed as a forward facing platform without a back.

The table below (Table 1) shows the distribution of child seat types used in this study. The 29% unknown rate is attributable to the factors mentioned previously.

Table 1.
Child Seat Type In The NASS CDS
1988-1996

Seat type	Nine Year Total Unweighted Count	Yearly Average Weighted Count	Yearly Average Weighted Percent
Infant	278	12211	13.6%
Toddler	355	18905	21.0%
Convertible	482	23044	25.6%
Booster	166	9291	10.3%
Other	9	330	0.4%
Unknown	511	26169	29.1%
Total	1801	89950	

Use of seat belts with child seats

The NASS CDS provides for the coding of proper and improper use of child seats. Unless the field researcher can view the child seat in the vehicle, the only source of information for the use of seatbelts with the child seat is from interviews conducted. This can be demonstrated by the 99% level of reported proper seat belt use with child seats. In the future we may be forced to drop the collection of this information.

Row placement of child seats

Most child seats can be found in the rear rows of the vehicle. This is a trend that can be seen to be gradually increasing from 59% in the rear seat row (1988-1990) to 66% (1994-1996) (Table 2).

Table 2.
Child Seat Distribution By Row
Yearly Average Weighted Count

	88-90	91-93	94-96	Total
Front	40%	41%	34%	38%
Rear	59%	59%	66%	62%

The first seat row of the vehicle is equally likely to contain a forward or rearward facing child seat (Table 3). However, rearward facing child seats are most likely to be found in the rear seat rows of the vehicle (71%) (Table 4).

Table 3.
Seat Row Distribution of Child Seats
Yearly Average Weighted Count

	Forward Facing	Rearward Facing	Unknown Orientation
First Row	42%	47%	11%
Second Row	8%	70%	22%

Table 4.
Child Seat Orientation By Row
Yearly Average Weighted Count

	First Row	Second Row
Forward Facing	76%	24%
Rearward Facing	29%	71%

The child seat type most likely to be in the first seat row is a convertible seat (28%), while the second seat row more likely contains a toddler or convertible seat (26%, 24%) (Table 5). However, when considering the use of the various types of seats, they have similar use patterns (40% in front, 60% in back), except toddler seats used 24% in the front seat and 76% in back (Table 6).

Table 5.
Seat Distribution of Child Seat Types
Yearly Average Weighted Count

Row	Infant	Toddler	Convert.	Booster	Unk
First	16%	14%	28%	11%	32%
Second	12%	26%	24%	10%	27%

Table 6.
Child Seat Type Distribution
Yearly Average Weighted Count

	First Row	Second Row
Infant	44%	56%
Toddler	24%	76%
Convertible	41%	59%
Booster	40%	60%

Harness, shield, and tether use

Child seats can come equipped with a harness, shield, tether, or some combination of these. NASS CDS field researchers note the presence and use of these features.

Harnesses are the feature most frequently present, except booster seats where shields predominate (Figure 1).

Shields are not present in about half the infant seats found in the crashes and are most often used with convertible seats (75%), while least used with booster seats (Figure 2).

Tethers are not very prevalent in the child seats found in the crashes. They were not present in more than 50% of the infant, convertible, and booster seats. When present, their use was low. The highest use rate was in convertible seats (31%) (Figure 3).

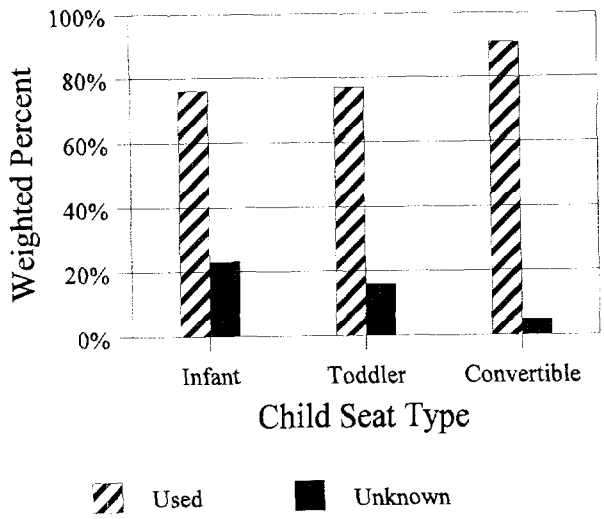

Figure 1. Child seat harness use, yearly average weighted percent.

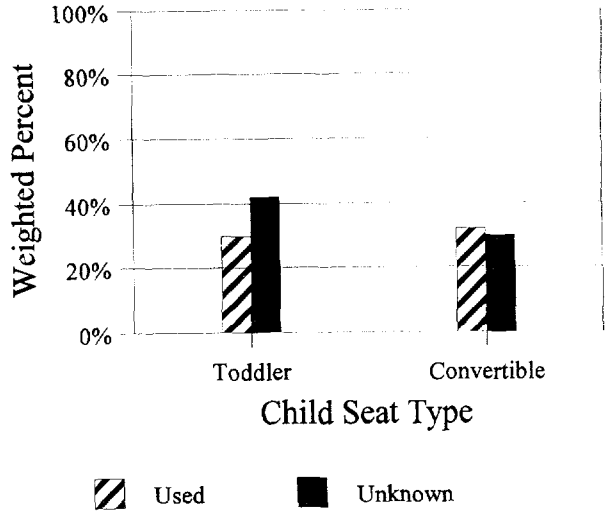

Figure 3. Child seat tether use, yearly average weighted percent.

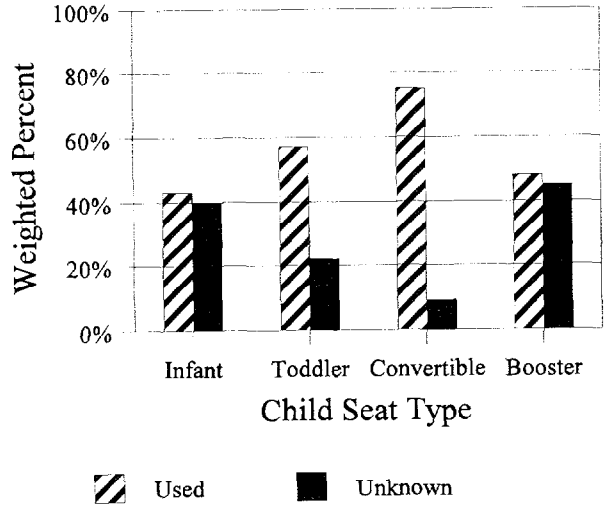

Figure 2. Child seat shield use, yearly average weighted percent.

Injury level by child seat feature used

When the available safety features of the child seat are used, there is a reduction in the maximum level of injury sustained by the child. All three features have an equivalent effect on maximum injury reduction. However, when the child is not using the harness that is available more severe injuries will result than if the shield or tether is not used (Tables 7,8,9).

Table 7.
Maximum Injury When Harness Used
Yearly Average Weighted Count

Harness Use	Max AIS 0	Max AIS 1+
Used	75%	25%
Not used	20%	80%

Table 8.
Maximum Injury When Shield Used
Yearly Average Weighted Count

Use	Max AIS 0	Max AIS 1+
Used	78%	22%
Not used	59%	41%

Table 9.
Maximum Injury When Tether Used
Yearly Average Weighted Count

Use	Max AIS 0	Max AIS 1+
Used	85%	15%
Not used	56%	44%

CONCLUSION

Information is available in the NASS CDS that indicates that not all features of child seats are used nor are the seats themselves placed properly in the rear seat of the vehicle. However, the data does show that their proper placement in the rear has improved from 1988-1996.