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Research Note

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Misuse of Child Restraints: Results of A Workshop to Review Field Data Results

Lawrence E. Decina, Kathy H. Lococo, and Alan W. Block¹

Child Passenger Safety (CPS) professionals have observed high levels of misuse of child restraint systems (CRSs) for many years. In the mid-1990s, a study conducted for the National Highway Traffic Safety Administration (NHTSA) observed one or more forms of misuse in 79.5 percent of the seats inspected (***Patterns of Misuse of Child Safety Seats***, DOT HS 808 440, January 1996). NHTSA recently updated that research.

NHTSA CRS Misuse Study

NHTSA awarded a contract in fall 2001 whose objective was to obtain a measure of the current level of CRS misuse among the general public. The study convened a group of experts to identify “critical” misuses, defined as forms of misuse that could reasonably be expected to raise the risk of injury to a child in the event of a crash. The critical misuses composed the overall misuse measure for the study. The critical misuse measures were:

- Age and weight appropriateness of CRS;
- Direction of CRS;
- Placement of CRS in relation to air bags;
- Installation and secureness of CRS to the vehicle seat (tight safety belt);
- Secureness/tightness of harness straps and crotch strap of the CRS;
- Use of locking clip for certain vehicle safety belts;

- Fit of vehicle safety belt across child in belt-positioning booster seat; and
- Defective or broken CRS elements.

Six States were selected in which to conduct observations: Arizona, Florida, Mississippi, Missouri, Pennsylvania, and Washington. Each State had a State site coordinator (SSC) who was responsible for the data collection effort in that State, including arranging sites, hiring field staff, and setting up quality control procedures. All SSCs were nationally certified CPS instructors/technicians. Data collection began late September 2002 and concluded early January 2003. The observation sites spanned diverse socioeconomic and demographic characteristics. Children under 80 lbs formed the target group. Field observation sites were primarily parking areas at community shopping centers, child merchandise department stores, fast food restaurants, health and medical facilities, and community events. The inspection sites were unannounced in order to avoid a self-selected sample of parents who had made a planned decision to go to a location to have a seat checked.

The field teams collected data on restraint use by 5,527 children under 80 lb in 4,126 vehicles. Among the key findings of the study:

- 72.6 percent of 3,442 observed CRSs displayed one or more critical misuses. The most common

¹ Lawrence Decina was principal investigator and Kathy Lococo senior analyst on the misuse study. Both are with TransAnalytics, LLC. Alan Block is a research psychologist in the NHTSA Office of Research & Technology who served as the Contracting Officer's Technical Representative (COTR) on the study. The workshop was performed as a subcontract through the University of North Carolina (UNC) at Chapel Hill, Highway Safety Research Center (HSRC) under the NHTSA contract “Behavioral Research for Traffic Safety” (DTNH22-02-D-85121).

misuses were loose vehicle safety belt attachment to the CRS and loose harness straps securing the child to the CRS. The level of misuse was greatest for CRSs appropriate for infants and toddlers: 83.9 percent of 497 infant seats, 83.5 percent of 140 rear-facing convertible seats, 81.9 percent of 1,247 forward-facing convertible seats, and 79.3 percent of 766 forward-facing-only seats.²

- 71.5 percent of 4,698 children under 60 lb in the current study were observed using a CRS compared to 50.6 percent of 5,865 children under 60 lb in the earlier NHTSA study. The increase in CRS use corresponded with a decrease in children using safety belts alone (without use of a child restraint), from 36.6 percent to 19.0 percent. Thus, comparison between the two studies suggested that children were being kept in CRSs longer.
- 11.8 percent of the children observed in the study were not using any type of occupant restraint (CRS or safety belt). Among children 60-to-79 lb, almost one-in-four (24.2 percent) was unrestrained.

More detailed information concerning the study methodology and field data results are contained in the NHTSA report **Misuse of Child Restraints** (DOT HS 809 671, March 2004).

Workshop To Review Field Data Results

Background

During the course of the misuse study, both the contractor and NHTSA decided there would be substantial benefit to bringing together the SSCs at the conclusion of the project to review the study results with NHTSA. The meeting would provide the opportunity for the SSCs to offer more detail concerning the context of the data, their impressions of what they saw, and to discuss misuse characteristics that they observed which they considered worth noting but may be hidden in, or fall outside of, the summary statistics. The meeting would also provide an opportunity for the participants to identify further analyses to perform on the study database that would be helpful in clarifying the CRS misuse problem.

The meeting with the SSCs took place in December 2003 in Washington, DC.³ NHTSA staff attended representing several different sections of the agency.

Workshop Discussion

Over the course of the two-day workshop, the SSCs raised a number of points concerning their observations in the field. The workshop did not attempt to bring the participants to a consensus. Rather, it was designed to familiarize the NHTSA attendees with the gamut of misuse characteristics and associated factors seen in the field. In some cases, the characteristic may have been unique to the site. Therefore, the bulleted items that follow are a compilation of individual comments rather than a description of common traits found across geographic locations. They refer to observed behaviors or situations that occurred with some frequency at one or more of the State sites. However they are not statistically-based observations.

Among the comments concerning CRS misuse and other issues, there were observed cases where:

- Harness straps on high-backed boosters were misrouted;
- Vehicle safety belts were used in lieu of the CRS harness on combination child seats/boosters restraining toddlers;
- CRSs were being used beyond the manufacturer's expiration dates;
- Parents customized and added accessories to their child safety seats (e.g., placing foam padding behind the CRS's original cushion pad, sewing crotch straps to CRSs, and using home products to secure harness straps).
- CRSs were put together from parts of more than one used CRS;
- Children were prematurely moved into booster seats from forward-facing seats;
- Parents were unsure when to graduate children from infant to convertible seats.

² Differences between this study and the previous NHTSA research in defining misuse, and in the child selection criteria (only up to 60 lbs in the earlier study), preclude direct comparison of misuse numbers.

³ The attending SSCs were Nancy Avery (Tucson SAFEKIDS), Cynthia Huff (Mississippi Safety Services), Cathy Metzger (SAFE KIDS St. Louis), Juli McGreevy (Pennsylvania consultant), and Kathy Kruger (Washington Safety Restraint Coalition). The Florida SSC, Lorrie Walker, was unable to attend. The Florida Field Site Manager, Kelly Hamilton, attended in her place (Florida Traffic Safety Research Center, Florida Atlantic University). Also in attendance were William Hall (UNC/HSRC), and Tracey Durham and Shannon Morris (Partners for Child Passenger Safety, Children's Hospital of Philadelphia).

There were only a small number of LATCH (Lower Anchors and Tethers for Children) installations observed in the study due to the technology having been introduced only recently. The SSCs observed instances in which drivers used the vehicle safety belt to attach the CRS to the vehicle **in addition to LATCH**, even though the safety belt is unnecessary to a LATCH attachment. The SSCs also reported some misuses of LATCH at both the lower anchor and tether positions:

- Tethers were wrapped around the head rest or swinging loose from the top of the CRS;
- There was more LATCH misuse in vehicles where the lower anchors were not visible but embedded into the vehicle seat bight (e.g., not being attached to lower anchor bar);
- Lower attachments were connected to cargo hooks or other devices in the vehicle.

Besides misuse of particular restraints, the SSCs noted instances where there were problems in where the child was sitting:

- Children in the cargo areas of pickup trucks;
- Children sharing the same vehicle seating position;
- Children unrestrained in the front seat despite a CRS sitting in the back seat.

The SSCs were asked to identify any patterns they noticed in terms of situational, behavioral, or physical characteristics associated with observed misuses. Many of the SSCs identified relationships between aspects of the vehicle and misuse or nonuse of restraints:

- Older vehicles were associated with a higher incidence of unrestrained children and more CRS misuse, especially loose vehicle safety belts due to difficulties with properly locking the vehicle safety belt's latchplate;
- The darker the tinting on vehicle windows, the less likely that children were restrained;
- Children were often seen unrestrained in the back of pickup trucks, including those with campers;
- The larger the van, the less likely that children seated in the back of the van were belted.

Other observed associations involved the people in the vehicles. One SSC remarked that male pickup truck drivers were less likely to restrain child occupants in CRSs than female pickup truck drivers. Grandparents were not

found to be particularly good practitioners of child occupant protection. In one State where there were many visiting grandparents, there appeared to be lower restraint use by children when grandparents were the drivers. In another State where there were many grandparents with custody of grandchildren, many of the grandparents were using old CRSs. A third SSC remarked that when a child was sitting on someone's lap, it often was a grandparent or older sibling.

While the study did not record the race nor ethnicity of study participants, the SSCs perceived greater proportions of unrestrained children and CRS misuse among racial, ethnic, and other minority populations such as African Americans, Native Americans, Hispanics, Haitians, Vietnamese, Ukrainians, Russians, Bosnians, and Asian Indians. Language barriers were noted for some of the groups. But race and ethnicity were not necessarily the key demographic variables related to nonuse, misuse, and proper use. One SSC stated that use and misuse at her observation sites seemed more related to socioeconomic characteristics than to race.

Increasing the number of children in the vehicle generally appeared to have an adverse effect on proper child restraint use. Other comments concerning children and their behavior included:

- Higher safety belt misuse (e.g., twisted belts, improper fit) on booster seats when the children indicated that they had buckled themselves;
- Multiple instances of observed misuse when older siblings were responsible for buckling younger children into CRSs in the back seats of vehicles;
- Nonuse of restraints by children going to football practice with equipment on their bodies (i.e., shoulder pads, helmets);
- A greater likelihood of children being unrestrained the farther away they were seated from the driver;
- More frequent restraint use in the morning than in the afternoon.

Workshop Recommendations

The SSCs saw a continued need for basic CPS messages stressing secure CRS attachments, keeping children in CRSs until safety belts fit them properly, having parents place children in the proper CRS for their size, and never placing children in the front seat with a front passenger air bag. They voiced concern that many pediatricians

and family practice physicians do not keep current with the latest CPS information and recommendations. Since many parents of young children follow advice from these physicians, the SSCs considered it important to deliver the most current information to these groups on a regular basis. Dissemination of CPS information through professional organizations (e.g., American Academy of Pediatrics, American Academy of Family Physicians) might be an effective method to reach these physicians as these associations regularly distribute medical and safety information to their membership through pamphlets and other materials.

Besides educating parents, workshop participants believed CPS information could be transmitted to teenagers through driver education programs; to booster-seat age children through public service announcements on regularly viewed television programs (e.g. Saturday morning cartoons); and to seniors through community senior centers and retirement communities.

The SSCs also recommended that “proper use” be included in State law provisions. Language within the laws that defines proper use would be helpful for law enforcement.

Additional Analyses

Following the workshop, TransAnalytics conducted several additional analyses of the data beyond those contained in the contractor final report at the request of NHTSA:

- Number of children less than 80 lb sitting on someone’s lap;
- Restraint use (CRS, safety belt, or unrestrained) by year of age for children less than 80 lb;
- Restraint use (CRS, safety belt, or unrestrained) by number of children less than 80 lbs in the vehicle;
- Restraint use (CRS, safety belt, or unrestrained) of children less than 80 lb by three levels of socioeconomic site characteristics;
- CRS misuse of children less than 80 lb by three levels of socioeconomic site characteristics.

Of the 5,527 children less than 80 lb, 25 were sitting on someone else’s lap. Of these 25 children, 21 were unrestrained, 3 were in a safety belt that secured both the child and the other occupant, and 1 was in a CRS that was on the lap of an adult occupant.

The number of children (less than 80 lb) in a CRS, safety belt, or unrestrained is shown in table 1 for each year of age, from less than 1 year old to 9+ years of age. The data illustrate that the older the children, the less likely they were to be restrained in a CRS.

Table 1

Type of restraint used by age, in 1-year intervals. (Children weighing less than 80 lb).

Age of Child	Restraint Type			Total
	CRS	Safety Belt	Un-restrained	
< 1 Year	658 (97.3%)	1 (0.15%)	17 (2.5%)	676 (100%)
1 Year	604 (95.0%)	4 (0.6%)	28 (4.4%)	636 (100%)
2 Years	656 (91.7%)	20 (2.8%)	39 (5.5%)	715 (100%)
3 Years	559 (83.4%)	48 (7.2%)	63 (9.4%)	670 (100%)
4 Years	439 (67.6%)	123 (19.0%)	87 (13.4%)	649 (100%)
5 Years	265 (46.1%)	214 (37.2%)	96 (16.7%)	575 (100%)
6 Years	152 (29.7%)	277 (54.2%)	82 (16.1%)	511 (100%)
7 Years	77 (17.0%)	292 (64.5%)	84 (18.5%)	453 (100%)
8 Years	24 (6.3%)	264 (68.9%)	95 (24.8%)	383 (100%)
≥9 Years	8 (3.1%)	188 (72.6%)	63 (24.3%)	259 (100%)
Total	3,442 (62.3%)	1,431 (25.9%)	654 (11.8%)	5,527 (100%)

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The number of children (less than 80 lb) in a CRS, safety belt, or unrestrained is shown in Table 2 by the number of children younger than 13 years of age riding in the vehicle. The data show a relationship between CRS use and number of children in the vehicle. In general, the more children in the vehicle, the lower the likelihood that children less than 80 lb will be restrained in a CRS.

Table 2
Restraint use of children (less than 80 lb), by number of children (younger than 13 years of age) in the vehicle.

Number of Children in Vehicle	Restraint Type			Total
	CRS	Safety Belt	Un-restrained	
1	1,693 (68.5%)	516 (20.9%)	262 (10.6%)	2,471 (100%)
2	1,331 (64.1%)	537 (25.8%)	210 (10.1%)	2,078 (100%)
3	339 (45.4%)	291 (38.9%)	117 (15.7%)	747 (100%)
4	66 (34.6%)	70 (36.6%)	55 (28.8%)	191 (100%)
5	8 (42.1%)	8 (42.1%)	3 (15.8%)	19 (100%)
6	5 (23.8%)	9 (42.9%)	7 (33.3%)	21 (100%)
Total	3,442 (62.3%)	1,431 (25.9%)	654 (11.8%)	5,527 (100%)

The number of children (less than 80 lb) in a CRS, safety belt, or unrestrained is shown in Table 3 by socioeconomic level. Drivers were not asked to provide socioeconomic information. State site coordinators were asked to subjectively categorize field sites into 1 of 3 socioeconomic levels (1=low to low-middle, 2=middle to middle-upper, and 3=upper), based on their opinion and familiarity with the sites. There were 75 field sites across the 6 States representing 31 low to low-middle sites, 35 middle to middle-upper sites, and 9 upper sites. Table 3 presents the results of the analysis. The data show that there was less CRS use in the low to low middle socioeconomic sites (by 15 to 16 percentage points) than in the sites categorized into higher socioeconomic levels.

Table 3
Restraint use of children (less than 80 lb) by socioeconomic category.*

Socio-economic Category	Restraint Type			Total
	CRS	Safety Belt	Un-restrained	
Low/ Low-Middle	1,319 (53.8%)	780 (31.8%)	354 (14.4%)	2,453 (100%)
Middle/ Middle-Upper	1,853 (69.0%)	575 (21.4%)	259 (9.6%)	2,687 (100%)
Upper Only	270 (69.8%)	76 (19.6%)	41 (10.6%)	387 (100%)
Total	3,442 (62.3%)	1,431 (25.9%)	654 (11.8%)	5,527 (100%)

* State site coordinators provided subjective ratings of socioeconomic category for each field site.

Analysis of CRS critical misuse by socioeconomic level was also performed. Table 4 presents this data.

Table 4
CRS critical misuse, by socioeconomic category.* (Children weighing less than 80 lb)

	Socioeconomic Status			Total
	Low/ Low-Middle	Middle/ Middle-Upper	Upper Only	
Number (percent) of CRSs with Critical Misuses	971 (73.6%)	1,310 (70.7%)	217 (80.4%)	2,498 (72.6%)
Total CRSs	1,319	1,853	270	3,442

* State site coordinators provided subjective ratings of socioeconomic category for each field site.