U.S. Department
Of Transportation
**National Highway
Traffic Safety
Administration**

Research Note

DOT HS 809 696

December 2003

Restraint Use of Large Truck Child Passengers Involved in Fatal Crashes

Cejun Liu*

Introduction

Due to the traditional commercial usage of large trucks, child passengers are usually transported in passenger vehicles. However, because a certain number of children travel in large trucks, their travel safety and restraint use are of concern. In this research note, the restraint use patterns of large truck child passengers aged 0-15 years involved in fatal crashes are examined.

Methodology

A child passenger is categorized as being restrained (child safety seat, shoulder and lap belt or restraint type unknown), unrestrained, or of unknown restraint use. Child passengers in large trucks aged 0 to 3, 4 to 7 and 8 to 15 years old are classified as a "fatality" or "survivor " of the crash. Unknown injury severity cases are not included. Data from the Fatality Analysis Reporting System (FARS) for the period 1988-2002 were used. The FARS database is a national census of police-reported motor vehicle crashes resulting in fatal injuries. It is conducted by the National Center for Statistics and Analysis (NCSA) in the National Highway Traffic Safety Administration (NHTSA).

Results

Tables 1 and 2 show large truck child passengers aged 0-15 that were killed or survived in fatal crashes by year, age group and restraint use from 1988 through 2002. The data concerning the fatally injured children show that 77 percent of children aged 0-3 years, 78 percent of children aged 4-7 years and 70 percent of children aged 8-15 years were not restrained (unrestrained children killed in passenger vehicles is 53 percent, 58 percent and 66 percent for these three age groups). In comparison, a higher percentage of children who survived in fatal crashes were restrained. This feature is also graphically illustrated by Chart 1.

Table 3 is a contingency table of restraint use by survival status for large truck child passengers, not including children where the restraint use is unknown. The number in the parenthesis is the row proportion (the same applies to Table 4).

Table 3: Contingency Table for Large Truck Child Passengers Age 0-15 in Fatal Crashes

Restraint Use	Survival Status	
	Killed	Survived
Used	17(0.047)	343(0.953)
Not Used	125(0.174)	593(0.826)
Source: NCSA FARS 1988-2002		

χ^2 test shows a strong association between restraint use and survival status in fatal crashes (χ^2=35.75, df=1, p<0.0001). The relative risk 3.7 (=0.174/0.047) [95% confidence limit (C.L.) is (2.26, 6.02)] indicates that a large truck child passenger killed in a fatal crash is roughly 4 times more likely to have been unrestrained than a child passenger who survived a fatal crash.

As a comparison, we also examine the restraint use of child passengers in passenger vehicles in two-vehicle fatal crashes involving a large truck and a passenger vehicle. See Table 4 for details.

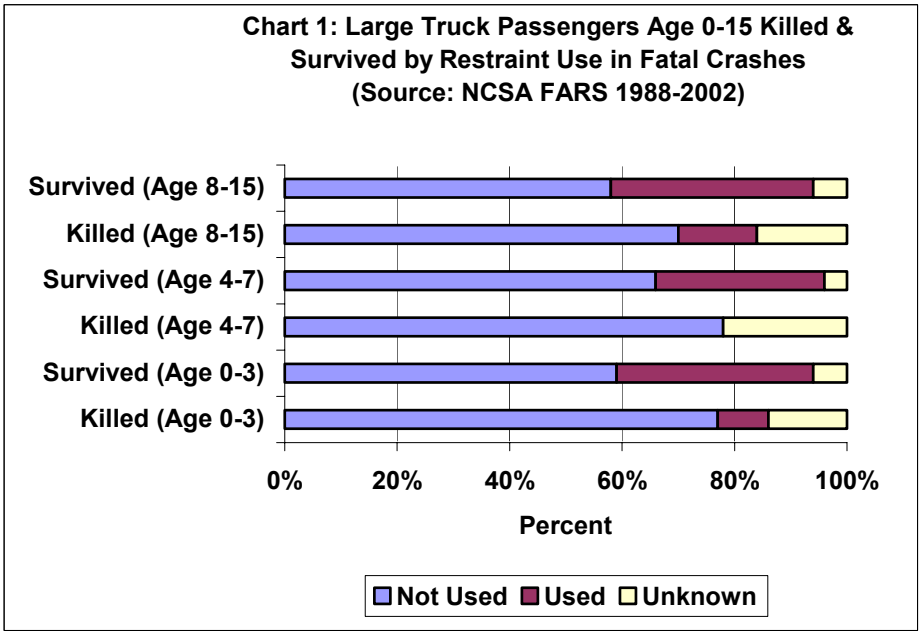
Table 4: Contingency Table for Passenger Vehicle Child Passengers Age 0-15 in Two-Vehicle Fatal Crashes Involving a Large Truck and a Passenger Vehicle

Restraint Use	Survival Status	
	Killed	Survived
Used	1042(0.34)	2039(0.66)
Not Used	1397(0.40)	2134(0.60)
Source: NCSA FARS 1988-2002		

Table 1 Large Truck Passengers Age 0-15 Killed by Year, Age Group and Restraint Use in Fatal Crashes									
Year	Age Group	Restraint Use						Sub-Total	Total
		Not Used	%	Used	%	Unknown	%		
1988	0 - 3	2	100	0	0	0	0	2	16
	4 - 7	3	100	0	0	0	0	3	
	8 - 15	9	82	1	9	1	9	11	
1989	0 - 3	1	100	0	0	0	0	1	13
	4 - 7	3	100	0	0	0	0	3	
	8 - 15	5	56	2	22	2	22	9	
1990	0 - 3	4	100	0	0	0	0	4	12
	4 - 7	0	0	0	0	0	0	0	
	8 - 15	6	75	2	25	0	0	8	
1991	0 - 3	0	0	0	0	0	0	0	11
	4 - 7	3	75	0	0	1	25	4	
	8 - 15	5	72	1	14	1	14	7	
1992	0 - 3	2	100	0	0	0	0	2	5
	4 - 7	2	100	0	0	0	0	2	
	8 - 15	1	100	0	0	0	0	1	
1993	0 - 3	3	100	0	0	0	0	3	10
	4 - 7	3	100	0	0	0	0	3	
	8 - 15	3	75	1	25	0	0	4	
1994	0 - 3	3	75	0	0	1	25	4	16
	4 - 7	1	50	0	0	1	50	2	
	8 - 15	8	80	1	10	1	10	10	
1995	0 - 3	0	0	0	0	1	100	1	7
	4 - 7	2	67	0	0	1	33	3	
	8 - 15	2	67	0	0	1	33	3	
1996	0 - 3	1	100	0	0	0	0	1	6
	4 - 7	3	75	0	0	1	25	4	
	8 - 15	1	100	0	0	0	0	1	
1997	0 - 3	1	50	1	50	0	0	2	13
	4 - 7	4	100	0	0	0	0	4	
	8 - 15	5	72	1	14	1	14	7	
1998	0 - 3	1	100	0	0	0	0	1	13
	4 - 7	0	0	0	0	2	100	2	
	8 - 15	8	80	0	0	2	20	10	
1999	0 - 3	2	50	0	0	2	50	4	10
	4 - 7	1	50	0	0	1	50	2	
	8 - 15	3	75	0	0	1	25	4	
2000	0 - 3	2	67	0	0	1	33	3	10
	4 - 7	1	50	0	0	1	50	2	
	8 - 15	4	80	1	20	0	0	5	
2001	0 - 3	3	100	0	0	0	0	3	16
	4 - 7	2	67	0	0	1	33	3	
	8 - 15	7	70	1	10	2	20	10	
2002	0 - 3	2	50	2	50	0	0	4	13
	4 - 7	3	100	0	0	0	0	3	
	8 - 15	0	0	3	50	3	50	6	
Total	0 - 3	27	77	3	9	5	14	35	171
	4 - 7	31	78	0	0	9	22	40	
	8 - 15	67	70	14	14	15	16	96	
Source: NCSA FARS 1988-2002									

Table 2 Large Truck Passengers Age 0-15 Survived by Year, Age Group and Restraint Use in Fatal Crashes									
Year	Age Group	Restraint Use						Sub-Total	Total
		Not Used	%	Used	%	Unknown	%		
1988	0 - 3	7	64	3	27	1	9	11	72
	4 - 7	17	85	3	15	0	0	20	
	8 - 15	28	68	10	25	3	7	41	
1989	0 - 3	6	55	4	36	1	9	11	50
	4 - 7	6	60	2	20	2	20	10	
	8 - 15	18	62	6	21	5	17	29	
1990	0 - 3	6	86	1	14	0	0	7	101
	4 - 7	12	80	2	13	1	7	15	
	8 - 15	63	80	14	18	2	2	79	
1991	0 - 3	8	73	3	27	0	0	11	54
	4 - 7	8	73	2	18	1	9	11	
	8 - 15	26	81	6	19	0	0	32	
1992	0 - 3	6	86	1	14	0	0	7	61
	4 - 7	6	60	4	40	0	0	10	
	8 - 15	24	54	17	39	3	7	44	
1993	0 - 3	4	50	4	50	0	0	8	59
	4 - 7	9	75	3	25	0	0	12	
	8 - 15	26	67	11	28	2	5	39	
1994	0 - 3	4	57	3	43	0	0	7	54
	4 - 7	11	69	4	25	1	6	16	
	8 - 15	19	61	12	39	0	0	31	
1995	0 - 3	5	56	4	44	0	0	9	64
	4 - 7	6	46	7	54	0	0	13	
	8 - 15	18	43	22	52	2	5	42	
1996	0 - 3	5	45	5	45	1	10	11	57
	4 - 7	9	69	3	23	1	8	13	
	8 - 15	18	55	10	30	5	15	33	
1997	0 - 3	4	44	4	44	1	12	9	72
	4 - 7	12	55	9	41	1	5	22	
	8 - 15	20	49	18	44	3	7	41	
1998	0 - 3	4	57	1	14	2	29	7	70
	4 - 7	10	59	6	35	1	6	17	
	8 - 15	22	48	18	39	6	13	46	
1999	0 - 3	5	62	3	38	0	0	8	69
	4 - 7	8	73	3	27	0	0	11	
	8 - 15	24	48	22	44	4	8	50	
2000	0 - 3	5	56	3	33	1	11	9	64
	4 - 7	9	90	1	10	0	0	10	
	8 - 15	23	51	21	47	1	2	45	
2001	0 - 3	11	61	6	33	1	6	18	83
	4 - 7	11	58	8	42	0	0	19	
	8 - 15	24	52	20	43	2	4	46	
2002	0 - 3	3	38	4	50	1	12	8	64
	4 - 7	8	50	7	44	1	6	16	
	8 - 15	15	38	23	57	2	5	40	
Total	0 - 3	83	59	49	35	9	6	141	994
	4 - 7	142	66	64	30	9	4	215	
	8 - 15	368	58	230	36	40	6	638	
Source: NCSA FARS 1988-2002									

χ^2 test shows an association between restraint use and survival status for passenger vehicle child passengers (χ^2=23.3, df=1, p<0.0001). The relative risk 1.18 (=0.40/0.34) [95% C.L. is (1.10, 1.25)] indicates that a passenger vehicle child passenger killed in a two-vehicle fatal crash involving a large truck is roughly 1.2 times more likely to have been unrestrained than a child passenger who survived the fatal crash. Thus, child passenger fatalities in large trucks are 3 times more likely to be unrestrained than those in passenger vehicles in two-vehicle fatal crashes involving a large truck.



---

*Cejun Liu is a Program Analyst employed by Rainbow Technology Inc., a contractor working for the Mathematical Analysis Division, National Center for Statistics and Analysis, NHTSA. Very useful suggestions and comments from Chou-Lin Chen, Dennis Utter, Joseph Tessmer at NCSA and Richard Gruberg at FMCSA, and technical assistance from Tom Bragan, Paul Lobo, Ellin Ramsey and Rajesh Subramanian at NCSA are acknowledged.

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 Cejun Liu [202-366-5354]. Internet users may access this research note and other general information on highway safety 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

NHTSA People Saving People www.nhtsa.dot.gov

MATHEMATICAL ANALYSIS DIVISION