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EVALUATION OF THE EFFECTS OF EDUCATIONAL AND LEGISLATIVE ACTIVITIES ON CHILD PASSENGER SAFETY IN NORTH CAROLINA 1981 - 1990

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This report has been extracted from a full project report prepared for the NC Governor's Highway Safety Program entitled "Comprehensive Program for Increasing Use of Safety Seats and Seat Belts for Children and Young Adults: Final Report 1990" (HSRC - PR 169). This full report summarizes a year of activities aimed at reducing occupant casualities among North Carolina's infants, children and young adults.

LIST OF TABLES

LIST OF FIGURES

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In 1977 the Highway Safety Research Center (HSRC) began a child passenger safety education program. With the financial support of the N. C. Governor's Highway Safety Program, HSRC has continued and expanded its efforts and goals to increase the proper use of safety seats and belts for children and young adults through a wide diversity of programs and activities. Over the past 13 years, legislation mandating the use of restraint systems for children was enacted and later expanded. Due in part to the results of this legislation, the use of safety belts for drivers and front seat occupants was also mandated by the N. C. Legislature. At the same time, state wide public education and education programs were conducted targeting many different audiences, teaching and training of health and safety professionals was routinely provided, and safety seat rental programs were established throughout the state.

Now there is a widespread network of individuals and organizations across the state who consider child passenger safety to be a primary concern and conduct various educational and promotional activities in their own communities. Occupant protection has become an integral part of educational messages and services provided by health professionals. Law enforcement officers serve as role models and educators as well as enforcing the occupant protection laws. The use of safety seats and belts is now the norm rather than the exception. Safety seat and belt usage rates for children in accidents have increased dramatically and fatal and serious injury rates have declined.

This report has been extracted from a full project report prepared for the NC Governor's Highway Safety Program entitled "Comprehensive Program for Increasing Use of Safety Seats and Seat Belts for Children and Young Adults: Final Report 1990" (HSRC - PR 169). This full report summarizes a year of activities aimed at reducing occupant casualties among our state's infants, children and youth.

Table 1 presents an overview of the restraint and fatality status of children involved in North Carolina car crashes during the past 15 years.

Table 1. Police Reported Restraint Usage and Fatalities for All 0-5 Year Old Occupants in North Carolina Crashes.

Year	% Restrained	# Killed	# Unrestrained	# Restrained
1974	5.4	28	28	0
1975	5.0	29	29	0
1976	4.6	26	26	0
1977	5.9	28	28	0
1978	4.7	36	36	0
1979	7.0	24	24	0
1980	10.5	18	18	0
1981	11.0	22	21	1
1982	17.4	17	16	1
1983	25.1	21	19	2
1984	34.4	20	17	3
1985	61.8	23	20	3
1986	75.7	25	18	7
1987	86.2	21	17	4
1988	86.4	39	28	11
1989	87.2	33	28	5

As was previously mentioned, educational efforts began in 1978 to attempt to convince parents to use safety seats and belts for their children in cars. Beginning in 1979 there was a slow but steady increase in the percentage of children who were reported to be buckled up in crashes. In July, 1982, the first Child Passenger Safety Law went into effect requiring parents to restrain their children under age two. Larger increases in reported restraint usage rates were seen beginning in 1982. In July, 1985, this law was expanded to require all drivers to buckle up all children less than age six. As would be expected, this legislative activity was associated with the largest increase in usage rates.

A quick glance at the fatality figures in Table 1 could bring about questions about the benefits, or lack thereof, of increased restraint usage. As many or more children have been killed in the past couple of years, with reported restraint usage at a high level, as were killed in earlier years with restraint usage very low. It is clear from an examination of the accident reports that the vast majority of these children who were killed were not restrained at the time of the crash. In fact, in 1989 thirteen

of the fatalities were suffered by children who were ejected from the vehicle in the crash or who fell from moving vehicles. These deaths almost certainly would not have occurred if the children had been secured in restraint systems.

Another reason to question the value of restraint systems is due to the number of children for the past several years who have been killed while restrained. This question and concern is related to the potential for negative publicity that could have an adverse effect on continued educational efforts. In reality, it should be the goal of any safety seat or seat belt educational program to see that all occupant fatalities are restrained at the time of the crash. This goal acknowledges the fact that there are going to be crashes that are so severe that they cannot be survived regardless of restraint status. Thus, if all vehicle occupants are properly restrained, all persons killed will be restrained and fatalities will have been reduced to the greatest extent possible. Based on a fatality reduction estimate of 60 percent for properly used safety seats and belts, there probably would have been 12 to 15 children killed in 1989, rather than 33, if all crash involved children had been restrained.

As shown in Figure 1, the police-reported restraint usage rate for children less than two (covered by the initial law) has increased from 28 percent in the year prior to the law to 93 percent from July 1989 through June 1990. While the reported usage rate for 2-5 year olds also increased substantially (from 8% to 86%) since 1982, the largest increase came after the expanded law went into effect in 1985. Note that the same trend holds true for the 6-15 year olds. These children became covered under the NC Seat Belt Law in October 1985 if riding in the front seat. Reported restraint usage rates for these children (from 4% prior to 1982 to 73% in 1990) also increased substantially only after it was legislatively mandated.

Figure 2 indicates another important trend that has been occurring during the past few years. Accident data in general, and North Carolina data in particular, indicates that the rear seat tends to be safer than the front seat regardless of restraint status. General child transportation safety information as well as instructions from safety seat manufacturers recommend that children be placed in the rear seat. As

Figure 1. Police Reported Restraint Usage Rates
for Accident Involved Children
January, 1981 through June, 1990

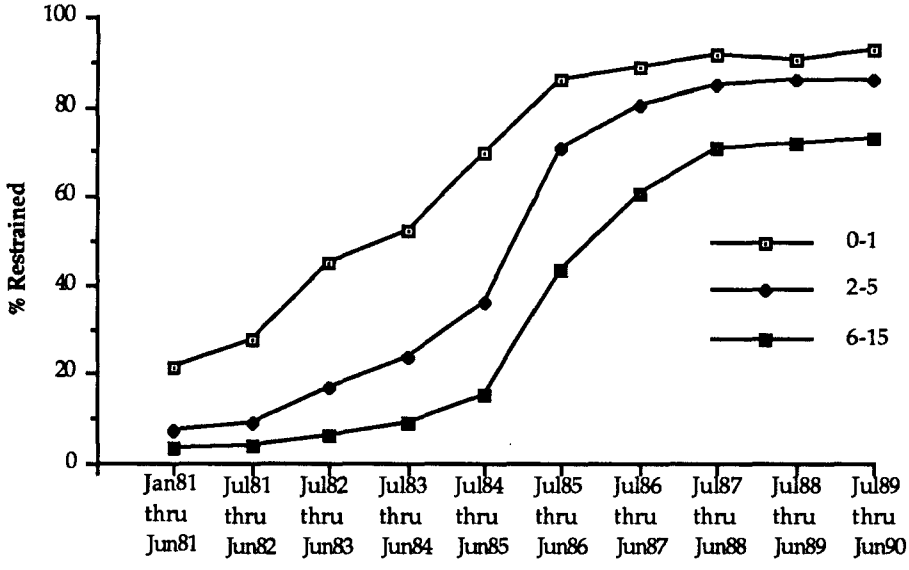


Figure 2. Percentage of Accident Involved 0-5 year Old
Children Riding in Front Seat Versus Rear Seat

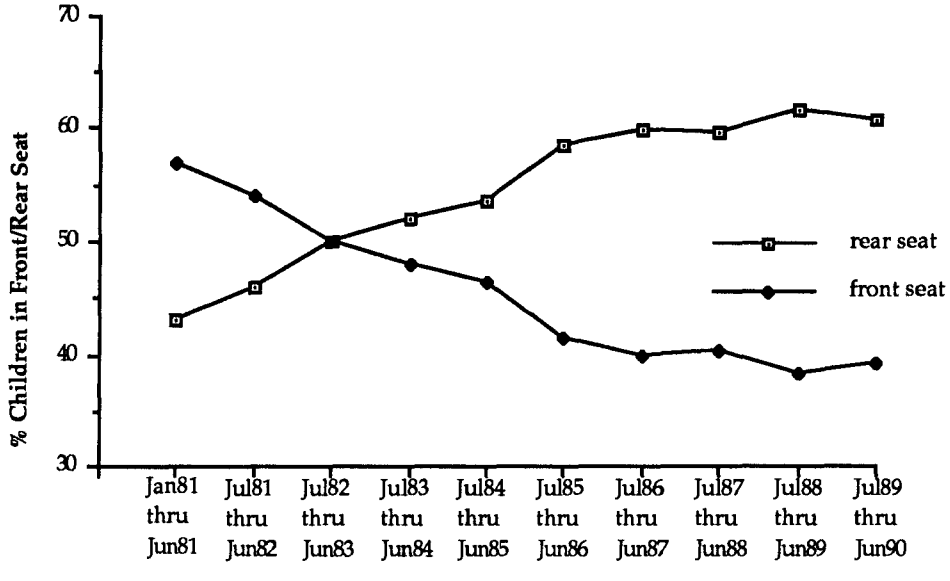


Figure 2 shows, more drivers are placing children in the rear seat. In the first six months of 1981, 57 percent of these children in crashes were in the front seat with 43 percent in the rear. During the last year, these proportions had been reversed and the differential was much larger. Between July 1988 and June 1989, only 39 percent of the children were in the front seat and 61 percent were being transported in generally safer rear seating positions. This same trend has not occurred among the 6-15 year olds. Four to five percent more 6-15 year olds have been front seat occupants each year during this time period. The North Carolina data shows that the percent of children who are seriously injured or killed is consistently larger than that fot the rear seat. Even without increasing the percentage of 6-15 year olds who buckle up, reductions in deaths and serious injuries to this age group could be realized by encouraging more rear seat travel.

Before proceeding any further in analyses of these accident data, mention should be made of possible biases in these restraint usage rates. In the "typical" accident in North Carolina, the investigating officer arrives at the accident scene some time after the crash. By then, the occupants may have already exited the vehicles and perhaps have already been transported for medical treatment. Many times, the investigating officer will have to rely on the statements of the occupants to determine use or nonuse of restraints. With the use of restraints for children now mandatory, parents may or may not be truthful in their statements of restraint use for their children.

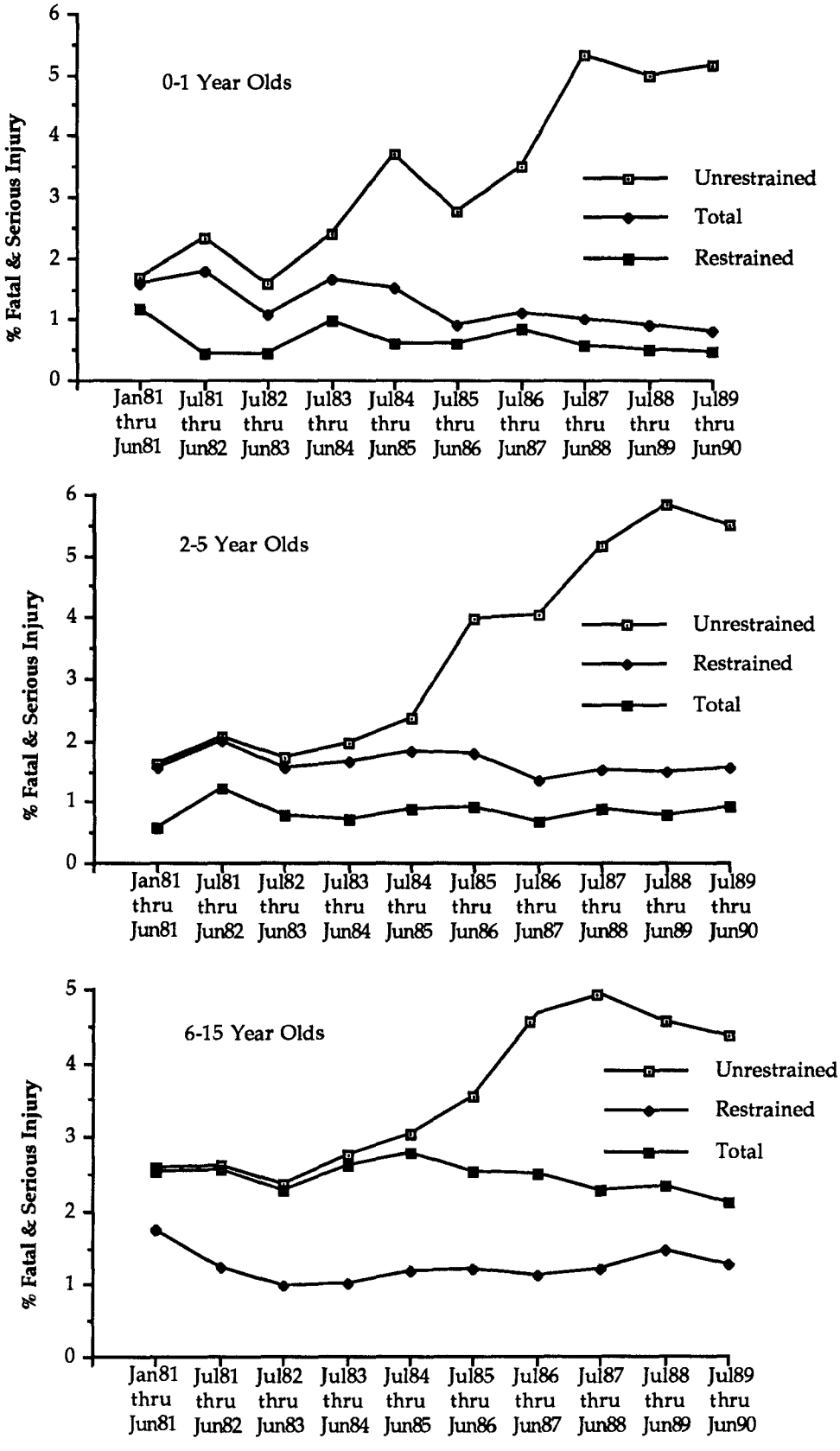
Previous comparisons of observed restraint usage rates for children and reported usage rates from the accident data appears to indicate that as children grow out of, or are taken out of their seats, they are more likely to go unrestrained but that when an accident occurs, the parent or driver tells the officer that the child was in a seat belt. Unless the officer has reason to believe otherwise, he or she will probably accept the statement and record the child as restrained. Observational surveys conducted this past summer found that 72 percent of the 0-5 year old children were restrained (Hall, et. al, 1989). This figure itself is well below the 86 percent usage rate derived from 1989 accident reports but similar to the self-reported figure for

respondents buckling up children "all the time" on mail-back questionnaires distributed in conjunction with the observational surveys. In addition, other HSRC research (Hunter, et al. 1988) found non-belt wearers to be overrepresented in crashes and thus one would expect usage rates to be lower for crashes than for observed usage rates.

The implications of this situation for the following analyses are several. First, actual restraint usage rates for children will not be as high as the accident data indicates. Secondly, comparisons between children classified as "restrained" and "unrestrained" must be viewed with caution since we cannot really be sure who was and who was not restrained. Thus, trends such as injury rates for the total age group will be more valid than those for children classified as either restrained or unrestrained. Third, this misclassification of restraint use may lead to a conservative estimate of the injury reduction potential of restraint use since many of the unrestrained children are actually being classified as restrained and thus their injuries are being counted among the restrained. On the other hand, an exaggerated estimate of effectiveness can result when bias on the part of the investigating officer leads to assumptions, and subsequent reporting, of restraints being used if injuries are minor and not used if injuries are more severe.

Figure 3 shows the fatal plus serious injury (K+A) rates for children in the 0-1, 2-5, and 6-15 age groups since 1981. These figures are encouraging to a degree but reveal that much work still needs to be done in protecting our children, particularly the older ones. For all age groups, the K+A rates for children reported to be unrestrained have been increasing across time by a factor of 70 to over 200 percent. At the same time, the K+A rate for the children reported to have been restrained has remained steady or increased only slightly across time (with any increases probably due to the increased exposure of more children to the most severe crashes, high levels of misuse of safety seats, and/or increased misreporting of restraint use). Since the 0-1 year olds have had a much larger proportion of children restrained, with a lower K+A rate, the overall K+A rate has been declining since 1982 with some fluctuations. On the other hand, the relatively small increases

Figure 3. Fatal plus Serious Injury Rates for Accident Involved Children, January, 1981 through June, 1990



in restraint usage rates for the older children had the effect of keeping the K+A rates for the 2-5 and 6-15 year olds almost level rather than decreasing until the last few time periods.

Table 2 shows the actual fatal and serious injury rates and the injury and population figures used to calculate the rates for Figure 3. Furthermore, average fatal plus serious injury rates have been computed for three time periods to try to measure the effects of legislation upon these rates. Time period "(A)" consists of the eighteen months immediately preceding the implementation of any child passenger protection law in North Carolina. Time period "(B)" consists of the three years (July 1982 - June 1985) that the original Child Passenger Safety (CPS) Law was in effect. During this time, only children less than age two being driven by their parents were required to be restrained. Period "(C)" consists of the first three years (July 1985 - June 1988) after the effective date of the expanded CPS Law. This expanded law requires all drivers to restrain all children through age five. Also, drivers and front seat occupants of any age have been required to be buckled up since October 1985.

The youngest age group, 0-1 years old, showed a fatal plus serious (K+A) injury rate of 1.74 per 100 children involved in crashes during the first time period. This rate was reduced by 17 percent to 1.45 during the second time period. The K+A rate dropped 32 percent to .99 between the second time period and the third time period representing the expanded law. Overall, the K+A rate for 0-1 year olds was reduced by 43 percent (from 1.74 to .99) between the first and third time periods.

K+A rates have also been reduced for the 2-5 year olds as well, though not by the same degree. The second period K+A rate of 1.72 was a 9 percent reduction from the rate of 1.88 for the first time period. During this time, the 2-5 year olds were not covered by the CPS Law, but their restraint usage had increased nonetheless. After they became covered by the CPS Law during the third time period, their K+A rates was reduced another 8 percent to 1.59. The total reduction in the K+A rate for the 2-5 year olds was 15 percent (from 1.88 to 1.56) between the first and the third time periods.

Table 2. Average Fatal Plus Serious Injury (K+A) Rates and Percent Change for Children < 16 Associated With NC Child Passenger Safety and Seat Belt Legislation

		(A) PRE-LAW		(B) ORIGINAL CPS LAW			(C) CURRENT CPS & BELT LAWS							
		Jan 81 Thru Jun 81	Jul 81 Thru Jun 82	Jul 82 Thru Jun 83	Jul 83 Thru Jun 84	Jul 84 Thru Jun 85	Jul 85 Thru Jun 86	Jul 86 Thru Jun 87	Jul 87 Thru Jun 88	Jul 88 Thru Jun 89	Jul 89 Thru Jun 90			
AGE	# K+A	20	45	30	35	42	33	34	31	33	29	PERCENT CHANGE		
0-1	Total #	1221	2514	2553	2133	2701	3337	2895	3046	3429	3458			
	% K+A	1.64	1.79	1.18	1.64	1.55	0.99	1.17	1.02	0.96	0.84	(A)→(B)	(B)→(C)	(A)→(C)
	Avg.%	1.74		1.45			0.99					-16.7	-31.7	-43.1
2-5	# K+A	75	205	169	183	214	213	178	213	225	233			
	Total #	4729	10204	10671	10926	11290	11798	12782	13479	14266	14544			
	% K+A	1.59	2.01	1.58	1.67	1.90	1.81	1.39	1.58	1.58	1.60			
	Avg.%	1.88		1.72			1.59					-8.5	-7.6	-15.4
0-5	# K+A	95	250	199	218	256	246	212	244	258	262			
	Total #	5950	12718	13224	13059	13991	15135	15677	16525	17695	18012			
	% K+A	1.60	1.97	1.50	1.67	1.83	1.63	1.35	1.48	1.46	1.45			
	Avg. %	1.85		1.67			1.47					-9.7	-12.0	-20.6
6-15	# K+A	295	660	604	697	780	719	789	737	774	710			
	Total #	11355	25269	25928	26145	27206	27737	30356	30473	31024	31602			
	% K+A	2.60	2.61	2.33	2.67	2.87	2.59	2.60	2.42	2.49	2.25			
	Avg. %	2.61		2.62			2.47					+0.4	-5.7	-5.4

Taken as a whole the expanded Child Passenger Safety Law has resulted in a 21 percent decrease (from 1.85 to 1.47) in fatal plus serious injury rates for children less than age six since the eighteen months prior to implementation of child passenger safety legislation in North Carolina.

The importance of restraint legislation is clearly documented by the K+A experience of the 6-15 year olds. These children and youths were not covered by any mandatory usage legislation until October 1985, and then only when riding in the front seat. Furthermore, high levels of restraint usage for all front seat occupants (60 78%) was not achieved until January, 1987 when the penalty phase of the Seat Belt Law went into effect. As shown in Figure 1, reported usage rates for the 6-15 year olds did not increase to any significant degree until they became covered and this is reflected in their K+A rates that have remained virtually constant across the three time periods. In fact, there was actually a small (.4%) increase in the K+A rate between the first and second time periods. There was, however, a 6 percent decrease between the second and third time periods after they became subject to the Seat Belt Law with most of this decrease coming after January, 1987 when the full penalty phase of the seat belt law went into effect.

Table 3 shows how these reductions in fatal and serious injury rates can be translated into estimates of actual lives saved and serious injuries reduced by increased restraint use associated with the Child Passenger Safety Law and to some degree the Seat Belt Law. In this table, an expected number of K+A injuries was computed for two time periods for each age group. This expected number was produced by multiplying the actual number of accident involved children of each age for the time periods July 82 - June 85 and July 85 - June 88 by the average K+A rate for the January 81 - June 82 period for the appropriate age group. This expected number is then compared to the actual number of K+A injuries seen in that time period. For instance, if the 0-1 year olds had continued to be killed at the same rate during July 82 - June 85 that they had during the Jan. 81 - June 82 period (1.74%), 129 0-1 year olds would have been killed or seriously injured during the time (.0174 x 7387 = 128.5). Instead, there were 107 actual K+A injuries during that time for a 17.1

Table 3. Casualty Benefits for Children and Youths Associated With Implementation of Restraint Laws in North Carolina.

	Jan 81 - June 82	July 82 - June 85				July 85 - June 90				July 82 - June 90
Age	Percent K+A	Number Involved	Expected K+A	- Actual K+A	= K+A Benefit (% Change)	Number Involved	Expected K+A	- Actual K+A	= K+A Benefit (% Change)	K+A Benefit (% Change)
0-1	1.74	7387	129	107	-22 (-17.1%)	16165	281	160	-121 (-43.1%)	-143 (-32.4%)
2-5	1.88	32887	618	566	-52 (-8.4%)	66879	1257	1062	-195 (-15.5%)	-247 (-13.2%)
0-5	1.85	40274	747	673	-74 (-9.9%)	83044	1538	1222	-316 (-20.5%)	-390 (-17.1%)
6-15	2.61	79279	2069	2081	+12 (+0.6%)	151192	3946	3729	-217 (-5.5%)	-205 (-3.4%)

percent reduction in K+A injuries of 22. Stated another way, this means that 22 children below age two were saved from death or serious injury between July 1982 and June 1985 due to implementation of the original Child Passenger Safety Law. During the next four years (July 85 - June 90), there was a 43 percent reduction in K+A injuries of 121. Overall, there has been a 32 percent benefit, which can be translated as 143 0-1 year old children saved from K+A injuries, since the original CPS Law was implemented in July 1982.

Among the 2-5 year olds, there has been a 13 percent reduction of 247 K+A injuries below what would have been expected since July 1982. These children were not actually covered in the July 82 - June 85 period, but there was apparently enough of a spillover effect in terms of increased restraint use to produce an 8 percent (-52 K+A) benefit to these children during that time. Once they became covered by the expanded law in July 1985 the benefits basically doubled (8.4% vs. 15.5% reduction).

Apparently, the 6-15 year olds have benefitted very little from any spillover effects of the Child Passenger Safety Law. In fact, during the July 82 - June 85 period, a slight increase in the actual K+A rate translated into a 0.6 percent increase in actual K+A injuries over the expected number. There was a small 5.5 percent benefit associated with the actual number of K+A injuries seen in the July 85 - June 90 period (3946) when compared to the expected number (3729) based on the 2.61 K+A rate for the first time period. There was an overall reduction of 205 K+A injuries seen for the 6-15 year olds after July, 1982.

One may wonder, however, why the actual number of fatalities for 0-5 year olds has not declined very much in recent years even with a reported restraint usage rate of 86 percent. It appears that there are several factors operating to keep this number up. One is exposure. Involvement figures from Table 2 indicate that in the January 1981 - June 1982 period, 18,668 children between ages of 0-5 were involved in N.C. car crashes for an average of 12,445 per year. In the July 1982 - June 1985 period, however, an average of 13,425 children were involved each year and this yearly average increased to 16,609 during the July 1985 - June 1990 period. This means that many more children are exposed each year to car crashes and potential

injuries and even greater reductions in injury rates will be needed to reduce actual numbers. For instance, as Table 2 also shows, there were 250 K+A injuries to 12,718 0-5 year olds during the July 198 - June 1982 period (for a rate of 1.97). During the July 1989 - June 1990 period, there were 262 K+A injuries to 18,012. To have reduced the actual number of injuries down to 200 during the latter period would have required a K+A rate of 1.11 rather than the 1.45 that is found.

Another factor to consider is crash severity. It does appear that crash severity is related to the increasing K+A rates for children reported to be unrestrained. Figure 4 illustrates that for each time period, children reported to be unrestrained tend to be involved more in severe crashes than the restrained children. Crash severity here is measured as the investigating officer's assessment of vehicle deformation (TAD rating). Severe crashes are herein defined as TAD ratings 4-7 on the 1-7 point TAD scale. For each time period, children reported to be unrestrained are overrepresented in severe crashes. Beginning in the July 84-June 85 period, the proportion of unrestrained children in severe crashes began to increase even more. While it appears that overall crashes are not becoming more severe, it is the case that the children who are reported not to be protected by restraint systems tend to be in more of the severe crashes and thus doubly exposed to serious injuries. While much of this difference is possibly real, it may be the fact that some of this difference is due to reporting bias. That is, an unrestrained child in a severe crash is more likely to be injured than in a less severe crash and the investigating officer would be less likely to accept the drivers report that the child was restrained and thus code the child as unrestrained.

Crash severity is affected by various factors, one of which is vehicle size. Due to their greater mass, larger heavier vehicles are inherently safer than smaller vehicles in similar crashes. The population of accident involved North Carolina children reflects current trends toward downsizing of vehicles. As Figure 5 indicates, about 21-23 percent of the accident involved children were in vehicles weighing less than 2500 pounds (roughly comparable to light compact and subcompact sized cars) during the first two time periods. This proportion increased

Figure 4. Proportion of Restrained and Unrestrained Children in Severe (TAD Severity 4-7) Crashes, 1981 through January, 1990

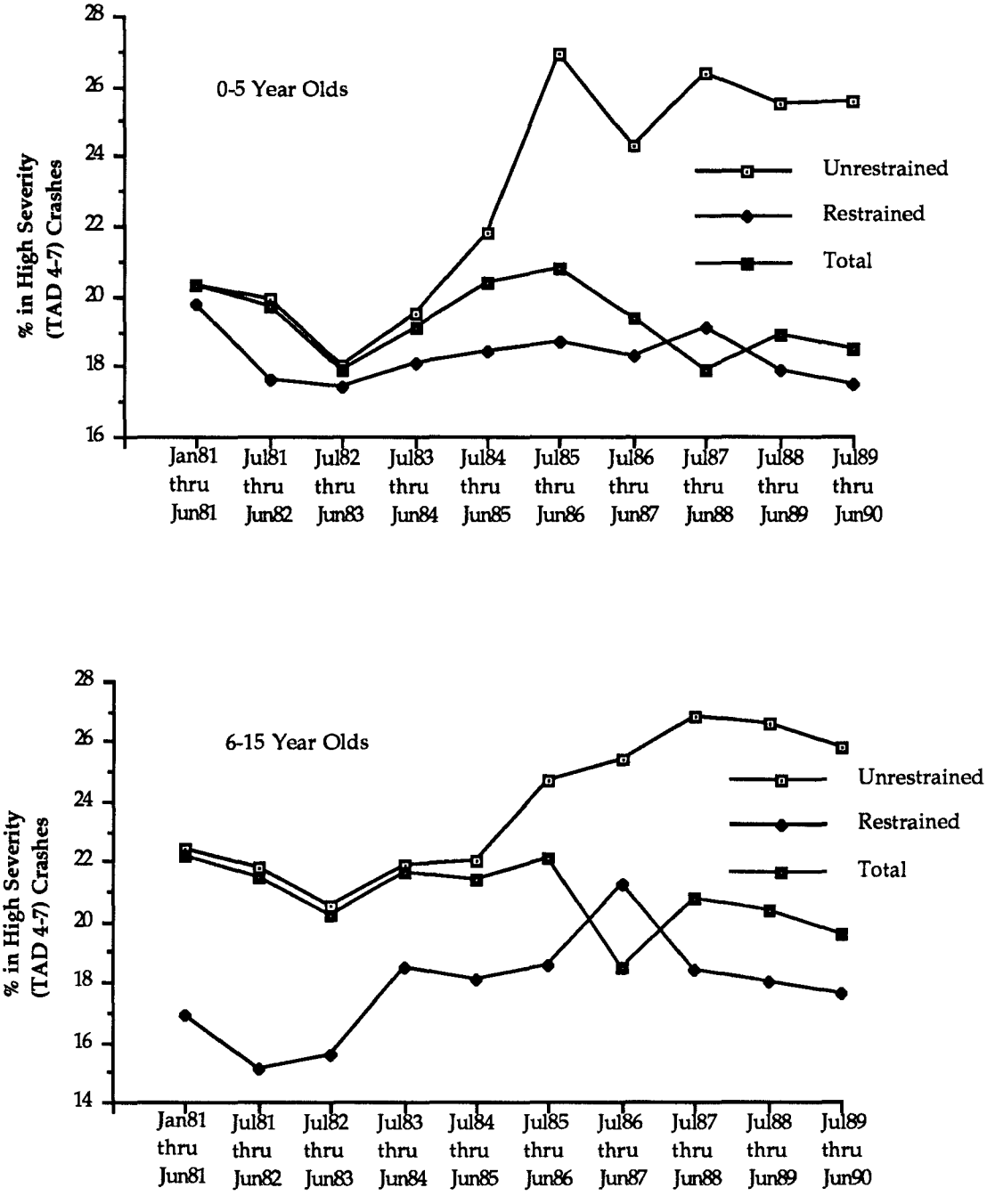
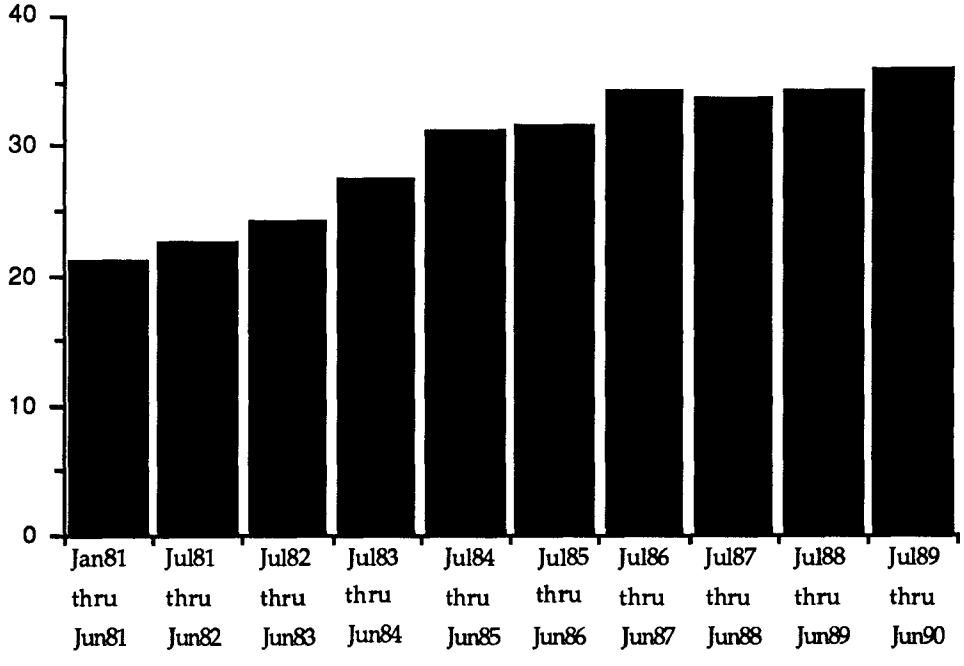


Figure 5. Percentage of Accident Involved 0-5 Year Old Children Riding in Vehicles Weighing Less than 2500 Pounds



to about 35 percent for the last year, a 50 percent increase. This trend is important for at least two reasons. First, with the shift toward less safe downsized vehicles it is crucial that efforts be continued to get children properly buckled up. Second, this trend may help to explain why overall injury rates for young children have not decreased as much as might be expected based on the increased proportion of children reported to be buckled up. Even with correct restraint use, injuries are more likely to occur in smaller vehicles.

A look at other factors provides additional areas where improvements in child passenger safety can be made to help reduce deaths and injuries further. Table 4 presents K+A rates for North Carolina by region of the state. The map on page 22 indicates the counties that have been included in the West, Central and East regions. As Table 4 indicates, the Central region has the lowest, and the West has the highest, total K+A rate for both the 0-5 and the 6-15 year olds. For the 0-5 year olds, both the West and Central regions have shown a decline in K+A injuries over the three legislative periods but the rate for the West has been reduced by only 10 percent whereas that for the Central region has been reduced by a third. During this time the K+A rate for the East has remained constant. For the 6-15 year olds, the K+A rate for the West has actually increased during this time. While these rates have been reduced for the Central and East, the reductions have been rather modest 11 and 8 percent reductions respectively. Statewide seat belt surveys have shown that belt wearing rates for drivers and front seat passengers are highest in the Central region with the West being the lowest (Reinfurt, et al, 1990). If the assumption is made that the patterns for restraining children are the same as for drivers and front seat occupants, this would mean that fewer children and youths are buckled in the West and East than in the Central region. The injury rates in Table 4 would seen to reflect such a pattern.

Table 5 indicates how K+A rates vary by urban/rural localities. As would be expected due to generally higher speeds and greater distances from medical treatment, K+A injuries rates are highest in rural (<30% developed) localities for both the younger and older children. As would also be expected, due to generally

Table 4. Fatal Plus Serious Injury Rates for Crash Involved Children in North Carolina by Region of State.

Region	0-5 Year Olds				6-15 Year Olds			
	Jan81-Jun82	Jul82-Jun85	Jul85-Jun90	Total	Jan81-Jun82	Jul82-Jun85	Jul85-Jun90	Total
West	1.90 * (14.6)**	2.08 (14.0)	1.71 (13.5)	1.85 (13.8)	2.86 (16.9)	3.14 (15.9)	3.35 (15.2)	3.21 (15.7)
Central	1.89 (53.8)	1.51 (54.4)	1.26 (55.7)	1.41 (55.1)	2.52 (54.8)	2.42 (54.9)	2.24 (55.3)	2.33 (55.1)
East	1.75 (31.5)	1.77 (31.6)	1.74 (30.8)	1.75 (31.2)	2.63 (28.3)	2.73 (29.2)	2.43 (29.5)	2.54 (29.2)

* Percent K+A injuries
** Percent of total occupants for each time period in each region

Table 5. Fatal Plus Serious Injury Rates for Crash Involved Children in North Carolina by Urban/Rural Locality.

Locality	0-5 Year Olds				6-15 Year Olds			
	Jan81-Jun82	Jul82-Jun85	Jul85-Jun90	Total	Jan81-Jun82	Jul82-Jun85	Jul85-Jun90	Total
Rural	3.02 * (26.4)**	2.79 (27.1)	2.53 (25.2)	2.67 (25.9)	3.99 (30.3)	4.16 (29.9)	4.14 (28.5)	4.12 (29.2)
Mixed	1.87 (21.6)	1.72 (19.7)	1.67 (18.4)	1.71 (19.2)	2.45 (22.0)	2.68 (20.0)	2.55 (18.8)	2.57 (19.6)
Urban	1.25 (52.0)	1.08 (53.3)	0.94 (56.4)	1.02 (54.9)	1.81 (47.8)	1.69 (50.1)	1.53 (52.6)	1.61 (51.2)

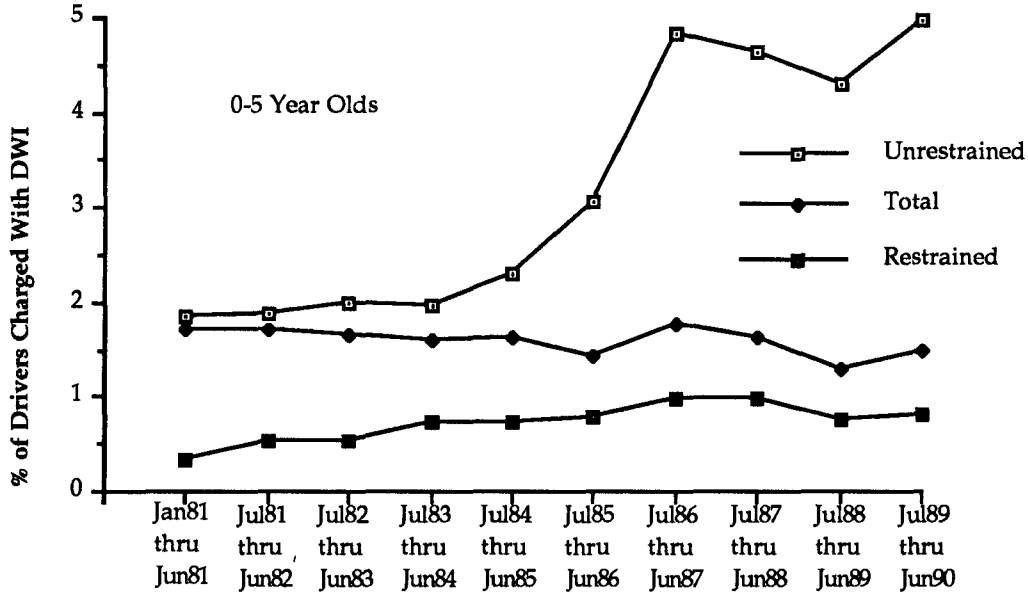
Rural = <30% Developed, Mixed = 30% - 70% developed, Urban = >70% Developed
* Percent K+A injuries ** Percent of total occupants for each time period in each locality

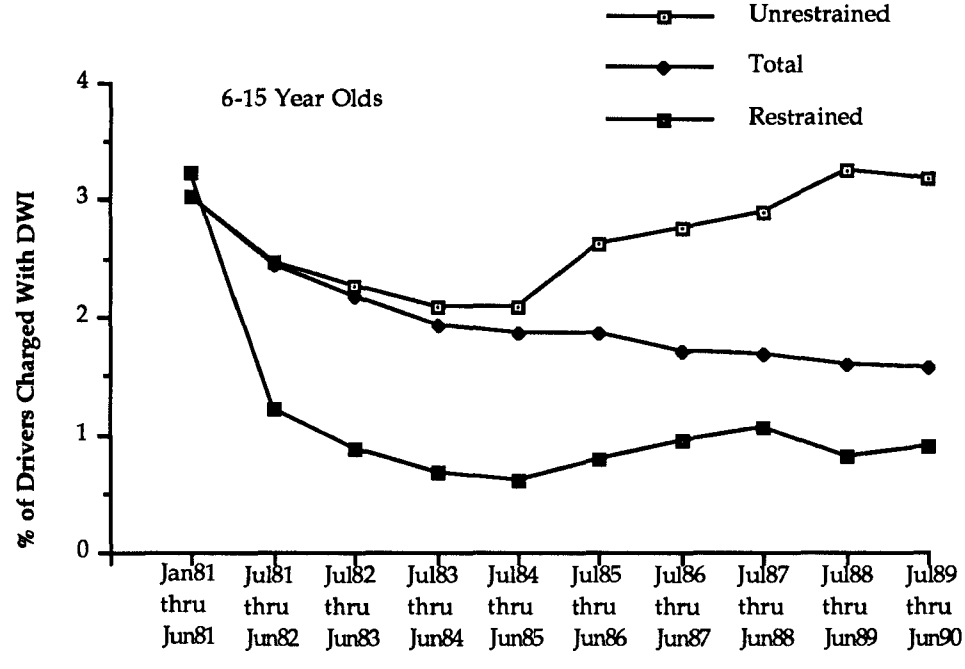
lower speeds and shorter distances from medical treatment, the rates are lowest in the urban areas (>70% developed) for both age groups. In fact, the K+A rate for the rural areas is over two an a half times greater than for urban areas for both age groups. For the 0-5 year olds, injury rates have declined for all three localities, but the 25 percent reduction in urban areas has been greater than the 16 and 11 percent reductions for rural and mixed localities. For the older children, injury rates increased by for percent for the rural and mixed localities and declined by 15 percent for the urban areas. The above mentioned seat belt surveys indicate that belt usage is higher in urban areas than in rural areas and this would help to explain at least some of the differences in injury rates between localities.

While looking at various trends associated with accident involved children, it is important to look at various factors in addition to restraint use to try to determine why the increased use of restraints for children has not had as great an impact on injuries, and especially fatalities, as might be expected. In addition to restraint use and vehicle factors, the driver is also an important component of safe transportation.

One of the most dangerous practices is that of drinking while driving and Figure 6 indicates the percentage of drivers who were charged by the investigating officer with a Driving While Impaired violation after the accident. As can be seen, there has been an almost constant proportion, in the 1.5 to 1.7 percent range, of all drivers who were charged with DWI after the accidents involving 0-5 year olds. As can also be seen, there have always been large differences between drivers of children reported to be restrained and unrestrained. Drivers of children reported to be unrestrained children are much more likely to have been charged with DWI. This difference increased greatly during the past three years. The same general relationship is found for the 6-15 year olds as well. In essence, what Figure 6 indicates is that the children who need protection the most, that is, riding with drinking drivers, are much less likely to receive the protection that they need.

Figure 6. Percent of Drivers of 0-5 Year Old Children Charged With Driving While Impaired





In large part, what the above discussion has shown is that the issue of restraint use for children is a complex one. North Carolina has a law that has had a great impact on this issue in that it has been the most effective means of getting parents and other drivers to restrain children in cars. At odds with the primary intent of this law -- to reduce deaths and injuries to children in car crashes -- are various driver and vehicles issues. As has been shown, most drivers are buckling up their children but the nonuse of restraints by a minority of other drivers may be counteracting some of the potential overall benefits of increased restraint usage. As was shown, drivers of children reported to be unrestrained were more likely to have been drinking prior to the accident. At the same time, more and more children are riding in smaller vehicles which means that even when buckled up, chances of injury are increased.

Conclusions

The following conclusions can be drawn based on this analysis of children involved in North Carolina accidents:

a) The North Carolina Child Passenger Protection and Seat Belt Laws, along with associated public information and education efforts, have resulted in large increases in restraint use as reported on police accident forms. In the year prior to the implementation of the first Child Passenger Safety Law in 1982, 21% of the 0-1 year olds, 8% of the 2-5 year olds, and 4% of the 6-15 year olds were reported to be restrained. During the year July 1989 - June, 1990, these rates were 93%, 86% and 73% respectively.

b) Average fatal plus serious (K+A) injury rates for children involved in accidents during this same time period have declined. During the eighteen months (January 1981 - June 1982) immediately preceding the implementation of the original CPS Law, K+A rates were 1.74 for 0-1 year olds, 1.88 for 2-5 year olds, and 2.61 for 6-15 year olds. During the July 1985 - June 1989 time period, average K+A rates were reduced 43% to 0.99 for 0-1 year olds, by 15% to 1.59 for 2-5 year olds, and by 5% to 2.47 for the 6-15 year olds.

c) Children reported to be unrestrained are more likely to have been in more severe crashes and/or to have been riding with a driver charged with Driving While Impaired.

d) The downsizing of the cars in which children are riding means that there will continue to be a need to stress the importance of correct restraint use for children and adults.

e) The implementation of restraint legislation has resulted in 17 percent reduction in fatal and serious injuries to 0-5 year old children in North Carolina crashes since July 1982. For 6-15 year olds, a 3 percent reduction was found. In terms of actual numbers, fatal and serious injuries have been reduced by 390 for 0-5 year olds and by 205 for 6-15 year olds since July 1982.

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North Carolina Geographical Regions