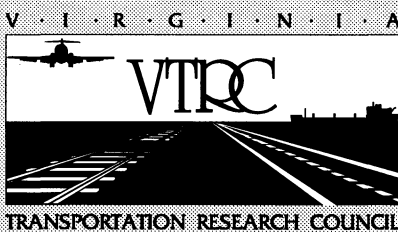


TECHNICAL ASSISTANCE
REPORT

**USE OF CHILD SAFETY SEATS
IN METROPOLITAN AREAS OF VIRGINIA
DURING SUMMER 1996**



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Supplementary Notes				
Abstract <p>The Transportation Safety Services of the Department of Motor Vehicles has, for a number of years, requested observational surveys of child safety seat use in the Commonwealth. The present survey was conducted in the summer of 1996 in the four metropolitan areas of the state where 54% of Virginia's population resides. The data were categorized as correct use, incorrect use, and no use for children judged by the survey team to be under age 4, that is, those required to be in a child safety seat under state law.</p> <p>Correct use was higher (57.7%) in the rear seats than in the front seats (44.4%). For the entire car, 55.0% of the children observed were in a correctly used child seat, 36.5% were not in a child seat, and 8.5% were in a seat that was obviously misused. The rate of correct use was probably overestimated because, with an in-traffic survey, the lap/shoulder belts holding the child seat in place cannot be checked for proper tension; a factor identified by other researchers as resulting in a high rate of incorrect use. The data also showed variations in the patterns of use in the four areas of the state surveyed.</p> <p>When the 1996 data were compared with those for 1993 and 1994, correct use (55.0%) was greater than that in 1993 (48.9%), but less than that in 1994 (64.0%). Incorrect use in 1996 (8.5%) was lower than that in 1993 (17.5%) and 1994 (10.4%). Non-use in 1996 (36.5%) was greater than that in 1993 (33.6%) and 1994 (25.7%).</p> <p>The 1996 data also show that non-use was greater in the Richmond (42.9%) and Roanoke (41.7%) areas. While non-use was lowest in Northern Virginia, nearly one-third of child occupants under 4 years old were not in a child safety seat. The data also show that child occupants of the front seats of cars have much higher incorrect and non-use rates than child occupants of the rear seats.</p> <p>It is recommended that the high rates of non-use and misuse be addressed through (1) programs that identify the problems and (2) increased education and enforcement on the part of the state and its localities. In addition, because the population of persons under age 4 is constantly changing (i.e., infants are born and others turn 4 and move out of the group), ongoing public information campaigns are required.</p>				

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(The opinions, findings, and conclusions expressed in this
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ABSTRACT

The Transportation Safety Services of the Department of Motor Vehicles has, for a number of years, requested observational surveys of child safety seat use in the Commonwealth. The present survey was conducted in the summer of 1996 in the four metropolitan areas of the state where 54% of Virginia's population resides. The data were categorized as correct use, incorrect use, and no use for children judged by the survey team to be under age 4, that is, those required to be in a child safety seat under state law.

Correct use was higher (57.7%) in the rear seats than in the front seats (44.4%). For the entire car, 55.0% of the children observed were in a correctly used child seat, 36.5% were not in a child seat, and 8.5% were in a seat that was obviously misused. The rate of correct use was probably overestimated because with an in-traffic survey, the lap/shoulder belts holding the child seat in place cannot be checked for proper tension, a factor identified by other researchers as resulting in a high rate of incorrect use. The data also showed variations in the patterns of use in the four areas of the state surveyed.

When the 1996 data were compared with those for 1993 and 1994, correct use (55.0%) was greater than that in 1993 (48.9%) but less than that in 1994 (64.0%). Incorrect use in 1996 (8.5%) was lower than in 1993 (17.5%) and 1994 (10.4%). Non-use in 1996 (36.5%) was greater than in 1993 (33.6%) and 1994 (25.7%).

The 1996 data also showed that non-use was greater in the Richmond (42.9%) and Roanoke (41.7%) areas. Although non-use was lowest in Northern Virginia, nearly one third of child occupants under age 4 were not in a child safety seat. The data also showed that child occupants of the front seats have much higher incorrect and non-use rates than child occupants of the rear seats.

The high rates of non-use and misuse should be addressed through (1) programs that identify the problems and (2) increased education and enforcement by the state and its localities. In addition, because the population of persons under age 4 is constantly changing (i.e., infants are born and others turn age 4 and move out of the group), ongoing public information campaigns are required.

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INTRODUCTION

Data on the use of safety belts in Virginia were first collected from 1974 through 1977 in the four metropolitan areas of the state: Roanoke/Salem/Vinton (western), Richmond/Henrico/Chesterfield (central), Norfolk/Virginia Beach/Hampton (eastern), and Fairfax County/Arlington/Alexandria (northern). Data collection was suspended from 1978 through 1982 because the management of the state's highway safety program saw no need to continue the collection. With the passage of the Child Safety Seat Law in 1982 (effective date January 1, 1983) requiring safety seat use by children under age 4, officials of the Department of Motor Vehicles (DMV) requested that data be collected on the use of child safety seats. They also requested that the collection of safety belt use data be resumed at the same time. A safety belt and child safety seat survey was conducted in March 1983, with additional surveys in June and October 1983. Safety belt and child safety seat use data have been collected at least annually since then, with the exception of 1995 when no child safety seat survey was conducted.

Over the years, the number of data collection sites was increased to make the data representative of statewide use. During the first 8 years (1974-1977 and 1983-1986), 27 urban sites were surveyed. In 1987, sites were added in communities with populations under 15,000. In 1990, sites were added in the urban areas, and in 1991, sites were added in cities with a population between 50,000 and 100,000. By 1991, there were 50 sites, and the number of sites in each area was based on the proportion of the state population that lived in the area surveyed. From 1983 through June 1992, the same sites were used to collect both safety belt and child safety seat data.

With the passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), data collection procedures in Virginia were modified to conform to federal guidelines. The federal guidelines required that data be collected from moving vehicles, in lanes other than the curb lane, and at both signalized and non-signalized intersections and that the use or non-use of the shoulder belt be considered in the determination of whether the occupant was correctly belted. The National Highway Traffic Safety Administration (NHTSA) also required that 120 randomly selected sites, statewide, be used. Failure to conform to the new guidelines would result in a state being ineligible to receive incentive funds under ISTEA Section 153. In making the required changes, Virginia lost its ability to determine child seat use rates for the same locations used for the safety belt survey because a child seat cannot be properly observed in a moving vehicle to determine the type of use. Although a new set of procedures and sites were

used for the § 153 surveys and these same sites have been used in all subsequent safety belt use surveys, all metropolitan area sites surveyed prior to 1993 were used for the special child safety seat surveys conducted in 1993, 1994, and 1996.

The type of data collected also changed over the years. Child seat use data were not collected during the first 4 years (1974-1977). From 1983 through 1985, child seat use was recorded as “yes” or “no” with the “no” response including incorrect use. From 1986 to 1994, use was recorded as “correct use,” “incorrect use,” or “no use.” Data on the sex of the occupant were recorded from 1983 through 1990. Data collection on ethnic group was begun in 1991 and discontinued in 1993.

In these surveys, the reported use rate was influenced by a number of factors, including the way the data were recorded and the amount and type of training given the observers (see Figure 1). From 1983 through 1985, when use was recorded as “yes” or “no,” correct use varied from 57.4% to 63.9%. In 1986, the first year incorrect use was recorded separately, correct use was reported at 68.9%. In 1987, because the state safety belt task force suspected that the rate of correct use was artificially high, a special training program was conducted for the observers that emphasized checking for incorrect use and the reported rate of correct use dropped to 44.2%. Although observers undergo training every year, there has been no special emphasis on surveying for incorrect use since 1987. Over the 7 years from 1988 through 1994, reported correct use rates have varied from 48.9% (1993) to 80.8%, with the peak occurring in 1990. In 1992, the highest rate of incorrect use (17.9%) was recorded since the special training in 1987.

In-traffic surveys do not allow observers to enter vehicles to check for installation characteristics. Only non-use and misuse obvious from outside the vehicle can be determined.

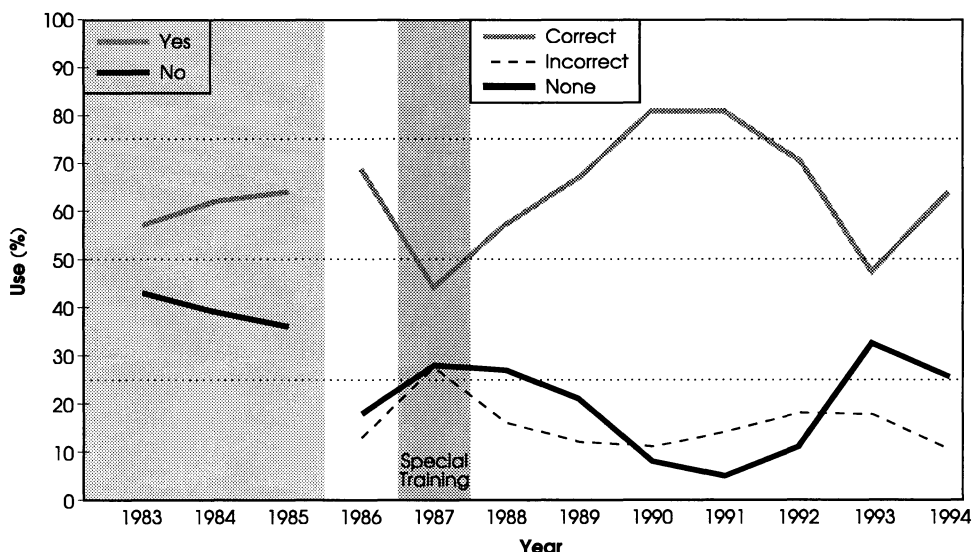


Figure 1. Rates of Child Safety Seat Use for the 1983-1994 Period

Thus, incorrect use is likely to be underestimated because the lap/shoulder belt holding the child seat in place cannot be checked for proper tension. Other researchers¹⁻⁴ have found that a great proportion of child safety seats are installed with the safety belt at the incorrect tension.

As part of its training program on installing a child safety seat, the Transportation Safety Training Center at Virginia Commonwealth University conducted a number of surveys at shopping centers and day care centers where trainees entered the car to check the child seat. In addition, the Community Traffic Safety Program in DMV District 5 (Tidewater) sponsored a number of safety seat checks in which the car was entered. These surveys were not intended to be representative of the general population of the state or of the area in which they were conducted. While acknowledging the biases in the data, both groups found an extremely high rate of misuse, with the most common (modal) rate being 88% and the misuse rate ranging from 75% to 94% (unpublished data). A loose lap/shoulder belt holding the child seat in position was the major reason for the misuse determination. These data probably overestimate the rate of incorrect use among the general population of the state because of the non-random and type-specific manner in which the sites and vehicles were selected and the criteria used in making the incorrect determination, but they indicate a serious installation problem.

Decina and Knoebel⁵ also found a number of misuse problems during their four-state survey of child safety seats. For children under age 4 (the same age used in Virginia), they found that of the nearly 72% in a child safety seat, just over 80% of the seats were misused. The four main misuse/no use factors involved the locking clip, chest (retainer) clip, harness strap, and vehicle safety belt.

PURPOSE AND SCOPE

The Transportation Safety Services of DMV requested that a survey of child safety seat use be conducted during the summer of 1996 to determine the rate of use by front-seat and rear-seat occupants of passenger cars who were under age 4. The survey was limited to the four metropolitan areas of the state, which account for 54% of the state's population.

METHODS

Data were collected at signalized intersections at 12 sites in the northern area, 11 in the eastern area, 7 in the central area, and 4 in the western area. The use of sites at shopping centers and day care centers was considered, but when a sample of these locations was checked at various times of day, either the traffic volume was inadequate or it was evident that the traffic was not representative of the socioeconomic status of the community at large.

There were two persons on each survey team. Each was trained in how to collect data, how to identify the factors that constituted correct and incorrect use, and how to estimate whether a child was under age 4. Because this was an in-traffic survey, two indices were used to help determine whether the child was under age 4. The first came from previous versions of the *Code of Virginia* in which required child seat users were defined as weighing 40 lb (18.1 kg) or less. The second was developed as an aid to police officers, where a required child seat user was defined as being 40 in (1.02 m) tall or less. In this survey, if the child was judged to be under 40 in (1.02 m) tall, weigh less than 40 lb (18.1 kg), or both, he or she was assumed to be under age 4.

Data were collected only from passenger cars in the curb travel lane (dedicated turn lanes were not considered as travel lanes), and no distinction was made between Virginia-licensed and out-of-state vehicles (the law makes no distinction between these categories of vehicles). When the cars stopped for the red signal, the observers left the curb and approached the car from the passenger side front fender. Each member of the survey team observed up to 15 cars per traffic light cycle, with the safety of the observer (staying clear of entrances to businesses) and traffic volume determining the number of cars surveyed. As required by state policy, each team member wore a hard hat and an orange vest.

Data were collected during four time periods each day: 7:30 to 9:00 A.M., 10:30 A.M. to 12:00 noon, 1:30 to 3:00 P.M., and 4:00 to 5:30 P.M.

In an effort to put the vehicle occupants at ease, survey personnel carried a clipboard lettered on the back with the message “Child Safety Seat Survey.” Upon seeing the message, many drivers lowered the car window and responded positively. No negative comments were reported by survey team members; i.e. they were not cursed or threatened, and they did not feel ill at ease over comments.

Child seat use was recorded as correct (C), incorrect (I), or non-use (N) (see Figure 2). Only those features easily identifiable from outside the vehicle were used to determine whether use was correct or incorrect. These features included the use of arm bars/shields, that the seat harness was properly clipped between the legs of the child, that the seat was facing in the proper direction for the age of the child, and that the lap/shoulder belt was routed through the child seat. For a response to be recorded as correct, all features had to be used in the correct manner. Misuse or non-use of any one feature required that the use be recorded as incorrect. Non-use was recorded if there was a child under age 4 in the car and no safety seat was present, a seat was present but was not being used, or a lap belt was being used in place of a safety seat.

In VTRC safety belt use surveys prior to 1993, the correct and incorrect use rates were combined into a total use figure. This was done because law enforcement officials interpreted the provisions of § 46.2-1094 of the *Code* requiring the use of safety belts to be met by *any* belt use regardless of whether it was proper or safe. For this report on child safety seat use, correct and incorrect use rates were *not* combined. Section 46.2-1095 of the *Code* states that a “child under the age of four [must be] *properly* secured in a child restraint device [emphasis added].”

CHILD SAFETY SEAT SURVEY

Summer 1996

Area _____ Site _____ @ _____ Sheet # _____

Vehicle	Front Seats			Back Seats		
	Driver	Middle	Right	Left	Middle	Right
1		C I N	C I N	C I N	C I N	C I N
2		C I N	C I N	C I N	C I N	C I N
3		C I N	C I N	C I N	C I N	C I N
4		C I N	C I N	C I N	C I N	C I N
5		C I N	C I N	C I N	C I N	C I N
6		C I N	C I N	C I N	C I N	C I N
7		C I N	C I N	C I N	C I N	C I N
8		C I N	C I N	C I N	C I N	C I N
9		C I N	C I N	C I N	C I N	C I N
10		C I N	C I N	C I N	C I N	C I N

Figure 2. Survey Form Used for Summer 1996

By keeping these data elements separate, the severity of the incorrect use problem can be determined, and state programs can be developed to address this traffic safety problem.

RESULTS AND DISCUSSION

The number of recorded correct, incorrect, and non-users at each site for 1993, 1994, and 1996 is shown in the Appendix, Tables A-1, A-2, and A-3. The individual site data were combined into four area totals (northern, eastern, central, and western), and the four area totals were combined into a metropolitan total (Tables A-4, A-5, and A-6).

Total Car Use

When the 1996 data for all four metropolitan areas were combined, the correct use rate was 55% (see Figure 3 and Table A-4). A large percentage of the children in the target group, those under age 4, were not using the required child safety seat (36.5%), and an additional 8.5%

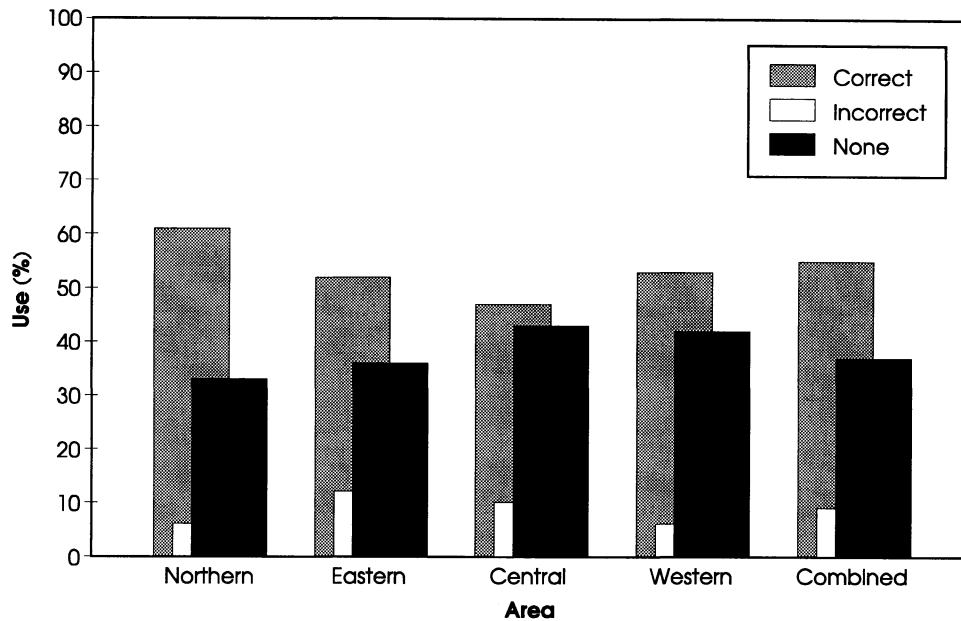


Figure 3. Rates of Child Seat Use for the Total Vehicle

were using it incorrectly. Because only features obvious from outside the car were used in making the correct or incorrect use determination, these data probably overestimate the rate of correct use. A loose lap/shoulder belt cannot be identified from outside the vehicle, and this is one of the major problems found when in-car safety seat checks are conducted.

When the data were considered on the basis of each metropolitan area, correct use rates in the eastern and western areas were nearly the same (52.2% and 52.8%). Correct use was highest in the northern area (61.2%) and lowest in the central area (47.4%). The rates of non-use were similar in the western and central areas (41.7% and 42.9%). The non-use rates in the northern and eastern areas were below those for the western and central areas, but nearly one third of these occupants (32.7% and 36.3%) were not in a safety seat. Incorrect use was 11.5% in the eastern area, 9.8% in the central area, 6.1% in the northern area, and 5.6% in the western area.

When the 1996 child safety seat use data were compared with those for 1994 and 1993, the overall metropolitan correct use was higher in 1996 than in 1993 (55.0% versus 48.9%) but was lower than in 1994 (55.0% versus 64.0%) (see Tables A-4, A-5, and A-6). Incorrect use was lower in 1996 (8.5%) than in 1993 (17.5%) and 1994 (10.4%). The percentage of children who were not in the legally required safety seat was higher in 1996 (36.5%) than in 1993 (33.6%) and 1994 (25.7%). When the 3 years of data were compared on a geographical basis, there was considerable variation between areas and between years, but the net result was a higher 1996 correct use in the northern area, a lower correct use in the eastern area, no real change in the central area, and mixed results in the western area. Incorrect use in the eastern area varied from 7.6% to 11.5% and in the central area from 9.8% to 13.9%. There was a major 3-year decrease in the rate of incorrect use in the northern area (21.9% to 6.1%) and the western area (33.3% to

5.6%). It is for the category of non-use where the data are the most discouraging. Other than for one case (1994 eastern), 9 of 12 categories of non-use exceeded 30%, and in 1996 for two areas (central and western), the non-use rate exceeded 40%.

Front Seat Use

When the 1996 data for all four metropolitan areas were combined, correct use was 44.4%, incorrect use was 10.5%, and non-use was 45.1% (see Figure 4 and Table A-4). There was considerable variability in use rates when the data were examined on the basis of geographical area. The central area had the lowest correct use rate (35.1%), the northern area had the highest (50.0%), and the rates in the eastern and western areas were 44.6% and 47.4%. The eastern and central areas had the highest incorrect use rates, 14.3% and 13.5%, and the northern and western areas had the lowest incorrect use rates, 6.0% and 5.3%. In each area, the percentage of children under age 4 who were not in a child safety seat exceeded 40%, with the western (47.4%) and central (51.4%) areas having the highest non-use rates.

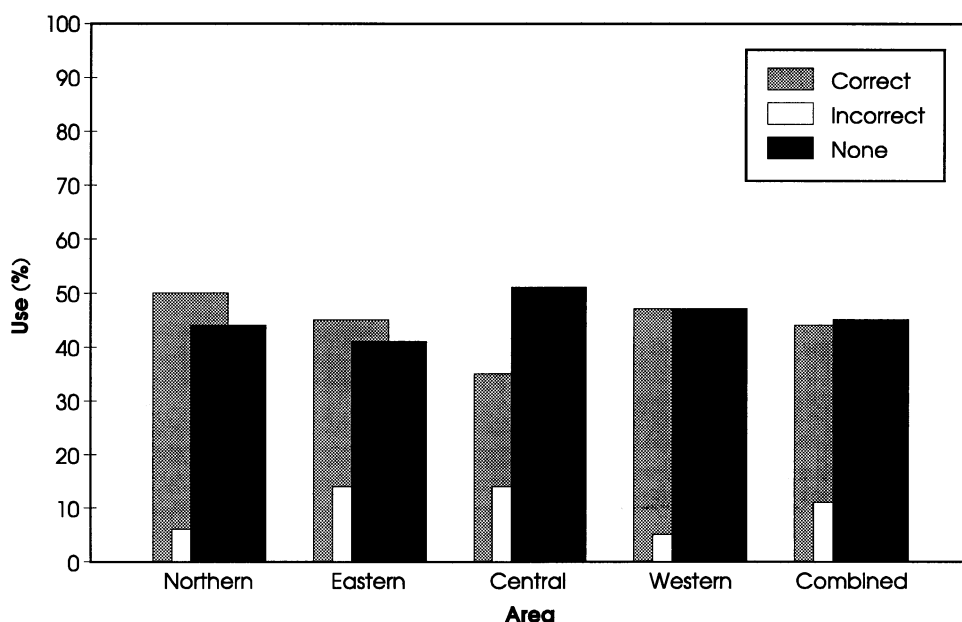


Figure 4. Rates of Child Seat Use for Front Seats

The 3 years of data on child safety seat use by front seat occupants were also considered on the basis of geographical area (see Tables A-4, A-5, and A-6). Over the three surveys, correct use in 1996 was higher in two areas (northern and western), little different in one area (eastern), and much lower in one area (central). Northern area correct use in 1996 was nearly double (50.0% versus 27.6%) that of 1993, and the rate increased each year. Although the 1996 correct use rate in the western area was more than double the 1993 rate (47.4% versus 23.5%), it was

slightly lower than the 1994 rate (50.0%). In the eastern area, correct use rose from 46.0% to 58.1% between 1993 and 1994 but then dropped to 44.6% in 1996. There has been a steady and substantial decline in correct use in the central area, from 55.2% (1993) to 35.1% (1996).

When the geographical area data were considered, both the northern (27.6% to 6.0%) and western areas (17.7% to 5.3%) had a major decline in the rate of incorrect use. There was a small decline in incorrect use in the eastern area (16.0% to 14.3%). The central area was the only area in which incorrect use by front seat occupants increased (6.9% to 13.5%).

Over the three surveys, 8 of the 12 classifications of non-use exceeded 40% and 3 others exceeded 30%. Non-use increased in the central area from 37.9% (1993) to 51.4% (1996). There was little difference in northern area non-use in 1993 (44.8%) and 1996 (44.0%), and the rate was marginally lower in 1994 (42.1%). The 1993 (38.0%) and 1996 (41.1%) non-use rates in the eastern area were similar, and both rates were much higher than in 1994 (27.9%). The western area had the most variability over the three surveys, declining by nearly 50% between 1993 (58.8%) and 1994 (30.0%) before rising to 47.4% in 1996.

Three factors are readily apparent from the metropolitan front seat belt use data. First, there has been a substantial decline (37.5%) in the percentage of incorrect child seat use, primarily because of declines in the northern and western areas. Second, a substantial percentage of the children are not protected by a child safety seat, more than 41% in all four metropolitan areas surveyed. These children are in an adult's lap, standing or sitting in the seat and/or floorboard, standing between the seats, or just "loose" in the front seats. Third, less than 50% of the children observed were in a child safety seat recorded as being correctly used.

Rear Seat Use

When the 1996 data for all four metropolitan areas were combined, correct use was 57.7%, incorrect use was 8.0%, and non-use was 34.2% (see Figure 5 and Table A-4). When the 1996 correct use data were examined on the basis of geographical area, there was less variability in the rear seat rates than in the front seat rates. Three areas (east, central, and west) had correct use rates between 52% and 55%, and the northern area had a correct use rate just over 63%. The eastern area had the highest incorrect use rate (10.7%), and the western area had the lowest (5.7%). Incorrect use in the northern area was 6.2%, and that in the central area was 8.3%. Non-use was also relatively stable among areas of the state, with the northern area at 30.5%, the eastern area at 35.0%, and the central and western areas at 39.6%.

In comparing front and rear seat incorrect use rates, the northern (6.2% versus 6.0%) and western areas (5.7% versus 5.3%) had minimally higher rear seat use, and the eastern (10.7% versus 14.3%) and central areas (8.3% versus 13.5%) had lower rear seat use. When the rear seat non-use rate was compared with the front seat non-use rate, all four areas had lower non-use for

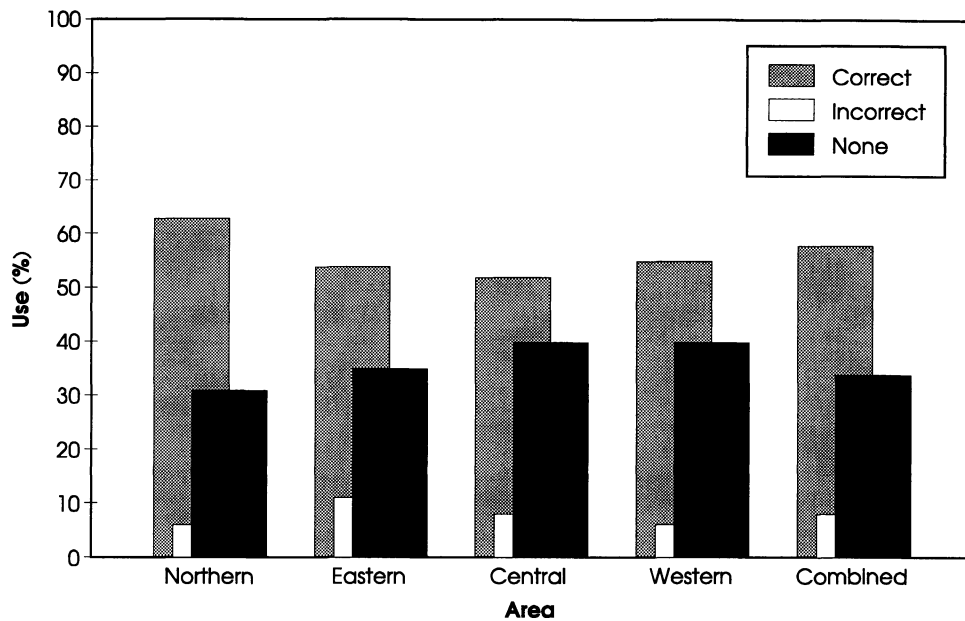


Figure 5. Rates of Child Seat Use for Rear Seats

the rear seats: northern (30.5% versus 44.0%), eastern (35.0% versus 41.1%), central (39.6% versus 51.4%), and western (39.6% versus 47.4%).

Child safety seat use data for 1996, 1994, and 1993 (there was no survey in 1995) were also considered on the basis of the geographical area of the state (see Tables A-4, A-5, and A-6). Over the 4-year period, correct use in 1996 was higher than in 1993 in the northern (63.3% versus 45.0%) and central areas (52.1% versus 44.4%), little different in the western area (54.7% versus 52.2%), and lower in the eastern area (54.2% versus 62.0%). Although the area correct use rates were generally higher in 1996 than in 1993, they were generally lower in 1996 than in 1994. The greatest difference between 1996 and 1994 was the decline in the eastern area (86.2% versus 54.2%). There was a small decline in the western area (63.2% versus 54.7%) and a minimal decline in the northern area (64.7% versus 63.3%).

There were large declines in the rates of incorrect use between 1993 and 1996 in the western (39.1% versus 5.7%), northern (20.6% versus 6.2%), and central areas (16.7% versus 8.3%). There was an increase in incorrect use in the eastern area (7.8% versus 10.7%). Generally, rates of incorrect use in the rear seats were higher than those in the front seats throughout the 1993-1996 period in the central and western areas and lower in the northern and eastern areas.

When non-use rates were considered over time by geographical area, the rates generally declined between 1993 and 1994 and then increased in 1996. The exception was in the western area, where non-use rose from 8.7% to 15.8% to 39.6%. In the central area, non-use was 38.9% in 1993 and 39.6% in 1996, rates that are essentially the same. In the eastern area, non-use

dropped from 30.2% in 1993 to 8.6% in 1994 and increased to 35.0% in 1996. The northern area rate dropped from 34.4% in 1993 to 25.6% in 1994 and rose to 30.4% in 1996. Each year rear seat non-use was lower than front seat non-use in the northern, eastern, and western areas and was lower in 1994 and 1996 in the central area.

Four factors are apparent from the data on child safety seat use in the rear seats. First, correct use was higher and incorrect use and non-use were lower in the rear seats than in the front seats. Second, in each geographic area, over 50% of the observed child occupants were in a child safety seat. Third, non-use ranged from 30% to 40%, with the worst rates occurring in the central and western areas. Fourth, non-use was higher in 1996 than in either 1993 or 1994 in three of the four areas and higher in 1996 than in 1994 in the fourth.

FINDINGS

- The percentage of non-use was high: 36.5%.
- Non-use was greater in the front seats than in the rear seats: 45.1% versus 34.2%.
- Non-use was greatest in the Richmond area: 42.9%.
- The percentage of incorrect use was low: 8.5%.
- Incorrect use was greater in the front seats than in the rear seats: 10.5% versus 8.0%.
- Incorrect use was greatest in the Tidewater area: 11.5%.
- Only 20.7% of the child occupants were in the front seats
- Between 1994 and 1996, correct use declined 14.1%.
- Between 1994 and 1996, non-use increased 42.0%.

CONCLUSIONS

- As in previous years, the rate of incorrect use is underestimated (and correct use overestimated) because in an in-traffic survey, the lap/shoulder belts holding the child seat in place cannot be checked for proper tension. In in-car safety seat checks, a loose lap/shoulder belt is one of the most common events leading to the making of an incorrect use determination.

- Because the child safety seat statute applies only to persons under age 4, nearly 25% of the infants in the observation group changes each year. This, coupled with a minimal child safety seat public information effort at both the state and federal level, resulted in relatively high rates of non-use and incorrect use.
- The problems of non-use and incorrect use need to be attacked.

RECOMMENDATIONS

- Virginia should implement a comprehensive statewide educational program emphasizing the high rate of non-use, especially in the front seats, and the consequences of not having a child protected by a child safety seat.
- The state, in cooperation with local communities, should develop local programs to identify incorrect child seat use and initiate methods to correct it.
- Local education and enforcement efforts should be ongoing. Each year, there is a new group of infants, and efforts to educate parents should be conducted continually.

ACKNOWLEDGMENTS

The author thanks Amy Rosinski, Kristen Gibney, and Jay Carini, who spent many hours traveling around the state, working from early morning to late afternoon, including weekends, to collect the data used in this report.

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APPENDIX

Table A-1
1996 Child Safety Seat Survey Results

Site Location	Front Seat			Rear Seat			Total Vehicle		
	C*	I	N	C	I	N	C	I	N
Northern Area									
1 Rolling Road	5	0	3	18	0	6	23	0	9
2 Route 7	2	1	2	17	4	13	19	5	15
3 S. George Mason	2	0	1	18	1	9	20	1	10
4 N. Glebe	5	2	9	22	4	12	27	6	21
5 Rose Hill	1	0	0	5	3	0	6	3	0
6 Jordan	1	0	0	2	1	3	3	1	3
7 Route 1	1	0	2	20	1	15	21	1	17
8 Woodbridge	0	0	1	5	0	3	5	0	4
9 Herndon	5	0	1	8	0	9	13	0	10
10 Vienna	1	0	1	28	1	3	29	1	4
11 Fairfax City	2	0	1	7	0	2	9	0	3
12 Annandale	0	0	1	14	1	4	14	1	5
Northern Area Total	25	3	22	164	16	79	189	19	101
Western Area									
1 Hershberger	0	0	2	3	0	2	3	0	4
2 Orange	0	0	1	3	0	2	3	0	3
3 Vinton	0	0	1	12	1	1	12	1	2
4 Salem	9	1	5	11	2	16	20	3	21
Western Area Total	9	1	9	29	3	21	38	4	30
Central Area									
1 Broad St.	1	0	0	3	0	2	4	0	2
2 Hull St.	0	0	4	3	0	15	3	0	19
3 Chester	5	0	4	5	2	3	10	2	7
4 Petersburg	1	1	3	11	3	7	12	4	10
5 Midlothian	2	2	3	6	0	3	8	2	6
6 Parham Rd.	2	1	2	16	1	2	18	2	4
7 9-Mile Rd.	2	1	3	6	2	6	8	3	9
Central Area Total	13	5	19	50	8	38	63	13	57
Eastern Area									
1 Independence	0	0	0	3	1	0	3	1	0
2 Kempsville	3	0	1	15	1	9	18	1	10
3 Chesapeake	3	0	1	8	0	3	11	0	4
4 Portsmouth	2	0	4	8	0	6	10	0	10
5 Route 170	1	0	1	10	0	7	11	0	8
6 Laskin	6	3	2	21	2	6	27	5	8
7 Brambleton	0	2	1	8	2	7	8	4	8
8 Military Circle	1	2	4	10	6	22	11	8	26
9 Denbigh	3	0	3	20	1	4	23	1	7
10 Hampton	4	0	4	10	2	2	14	2	6
11 Route 143	2	1	2	6	9	9	8	10	11
Eastern Area Total	25	8	23	119	24	75	144	32	98
Urban Total	72	17	73	362	51	213	434	68	286
Grand Total									788

*C = Correct; I = Incorrect; N = None

Table A-2
1994 Child Safety Seat Survey Results

Site Location	Front Seat			Rear Seat			Total Vehicle		
	C*	I	N	C	I	N	C	I	N
Northern Area									
1 Rolling Road	1	0	1	11	0	0	12	0	1
2 Route 7	3	1	3	6	1	7	9	2	10
3 S. Geo. Mason	2	0	1	20	6	10	22	6	11
4 N. Glebe	2	1	0	7	0	3	9	1	3
5 Rose Hill	2	0	3	3	0	4	5	0	7
6 Jordon	0	1	4	10	3	3	10	4	7
7 Route 1	1	1	3	8	3	5	9	4	8
8 Woodbridge	4	0	1	4	0	1	8	0	2
9 Herndon	2	1	1	9	2	1	11	3	2
10 Vienna	1	1	2	12	0	1	13	1	3
11 Fairfax City	4	1	4	5	0	3	9	1	7
12 Annandale	4	0	1	6	0	2	10	0	3
Northern Area Total	26	7	24	101	15	40	127	22	64
Western Area									
1 Hershberger	0	0	1	3	2	1	3	2	2
2 Orange	0	0	1	3	0	0	3	0	1
3 Vinton	3	2	0	3	1	1	6	3	1
4 Salem	2	0	1	3	1	1	5	1	2
Western Area Total	5	2	3	12	4	3	17	6	6
Central Area									
1 Broad St.	2	0	0	1	3	0	3	3	0
2 Hull St.	1	0	4	3	1	5	4	1	9
3 Chester	1	0	4	6	2	3	7	2	7
4 Petersburg	5	1	5	7	0	4	12	1	9
5 Midlothian	1	0	0	3	0	0	4	0	0
6 Parham Rd.	4	1	1	2	1	1	6	2	2
7 9-Mile Rd.	0	1	1	4	0	4	4	1	5
Central Area Total	14	3	15	26	7	17	40	10	32
Eastern Area									
1 Independence	4	0	0	6	0	2	10	0	2
2 Kempsville	6	1	0	17	1	1	23	2	1
3 Chesapeake	0	1	3	10	0	0	10	1	3
4 Portsmouth	1	0	1	3	0	0	4	0	1
5 Route 170	2	0	0	3	1	1	5	1	1
6 Laskin	9	2	0	23	0	1	32	2	1
7 Brambleton	0	0	2	4	0	0	4	0	2
8 Mil. Circle	1	0	3	6	1	1	7	1	4
9 Denbigh	1	1	0	9	2	2	10	3	2
10 Hampton	1	0	2	9	1	1	10	1	3
11 Route 143	0	1	1	10	0	1	10	1	2
Eastern Area Total	25	6	12	100	6	10	125	12	22
Urban Total	70	18	54	239	32	70	309	50	124
Grand Total									483

*C = Correct; I = Incorrect; N = None

Table A-3
1993 Child Safety Seat Survey Results

Site Location	Front Seat			Rear Seat			Total Vehicle		
	C*	I	N	C	I	N	C	I	N
Northern Area									
1 Rolling Road	0	3	0	12	4	0	12	7	0
2 Route 7	1	1	1	2	6	8	3	7	9
3 S. Geo. Mason	1	0	2	11	3	10	12	3	12
4 N. Glebe	0	0	0	3	2	1	3	2	1
5 Rose Hill	0	0	1	6	2	3	6	2	4
6 Jordon	1	1	1	3	1	2	4	2	3
7 Route 1	1	0	2	1	0	1	2	0	3
8 Woodbridge	0	0	0	3	1	1	3	1	1
9 Herndon	0	1	0	3	2	3	3	3	3
10 Vienna	2	1	1	4	1	5	6	2	6
11 Fairfax City	2	0	2	9	1	8	11	1	10
12 Annandale	0	1	3	2	4	3	2	5	6
Northern Area Total	8	8	13	59	27	45	67	35	58
Western Area									
1 Hershberger	0	0	2	4	1	1	4	1	3
2 Orange	1	0	0	2	3	0	3	3	0
3 Vinton	1	2	5	13	6	1	14	8	6
4 Salem	2	1	3	5	8	2	7	9	5
Western Area Total	4	3	10	24	18	4	38	21	14
Central Area									
1 Broad St.	4	0	2	0	0	10	4	0	12
2 Hull St.	1	1	1	2	1	6	3	2	7
3 Chester	4	1	2	8	3	2	12	4	4
4 Petersburg	2	0	3	1	1	7	3	1	10
5 Midlothian	2	0	2	8	3	0	10	3	2
6 Parham Rd.	2	0	1	10	3	1	12	3	2
7 9-Mile Rd.	1	0	0	3	1	2	4	1	2
Central Area Total	16	2	11	32	12	28	48	14	39
Eastern Area									
1 Independence	0	0	0	0	0	0	0	0	0
2 Kempsville	1	1	1	7	0	4	8	1	5
3 Chesapeake	3	1	1	15	0	3	18	1	4
4 Portsmouth	3	1	4	8	1	5	11	2	9
5 Route 170	1	1	0	5	1	4	6	2	4
6 Laskin	7	4	6	12	3	3	19	7	9
7 Brambleton	0	0	0	4	0	5	4	0	5
8 Mil. Circle	1	0	2	4	2	5	5	2	7
9 Denbigh	6	0	3	14	0	3	20	0	6
10 Hampton	1	0	0	8	0	1	9	0	1
11 Route 143	0	0	2	3	3	6	3	3	8
Eastern Area Total	23	8	19	80	10	39	103	18	58
Urban Total	51	21	53	195	67	116	246	88	169
Grand Total									503

*C = Correct; I = Incorrect; N = None

Table A-4
1996 Child Safety Seat Use by Area (%)

Total Vehicle

	Northern	Eastern	Central	Western	Combined
Correct	61.2	52.2	47.4	52.8	55.0
Incorrect	6.1	11.5	9.8	5.6	8.5
None	32.7	36.3	42.9	41.7	36.5

Front Seats

	Northern	Eastern	Central	Western	Combined
Correct	50.0	44.6	35.1	47.4	44.4
Incorrect	6.0	14.3	13.5	5.3	10.5
None	44.0	41.1	51.4	47.4	45.1

Rear Seats

	Northern	Eastern	Central	Western	Combined
Correct	63.3	54.2	52.1	54.7	57.7
Incorrect	6.2	10.7	8.3	5.7	8.0
None	30.5	35.0	39.6	39.6	34.2

Table A-5
1994 Child Safety Seat Use by Area (%)

Total Vehicle

	Northern	Eastern	Central	Western	Combined
Correct	59.6	78.6	48.8	58.6	64.0
Incorrect	10.3	7.6	12.2	20.7	10.4
None	30.1	13.8	39.0	20.7	25.7

Front Seats

	Northern	Eastern	Central	Western	Combined
Correct	45.6	58.1	43.8	50.0	49.3
Incorrect	12.3	14.0	9.4	20.0	12.7
None	42.1	27.9	46.9	30.0	38.0

Rear Seats

	Northern	Eastern	Central	Western	Combined
Correct	64.7	86.2	52.0	63.2	70.1
Incorrect	9.6	5.2	14.0	21.1	9.4
None	25.6	8.6	34.0	15.8	20.5

Table A-6
1993 Child Safety Seat Use by Area (%)

Total Vehicle

	Northern	Eastern	Central	Western	Combined
Correct	41.9	57.5	47.5	44.4	48.9
Incorrect	21.9	10.1	13.9	33.3	17.5
None	36.3	32.4	38.6	22.2	33.6

Front Seats

	Northern	Eastern	Central	Western	Combined
Correct	27.6	46.0	55.2	23.5	40.8
Incorrect	27.6	16.0	6.9	17.7	16.8
None	44.8	38.0	37.9	58.8	42.4

Rear Seats

	Northern	Eastern	Central	Western	Combined
Correct	45.0	62.0	44.4	52.2	51.6
Incorrect	20.6	7.8	16.7	39.1	17.7
None	34.4	30.2	38.9	8.7	30.7