

Standard Title Page - Report on State Project

Report No. VTRC 05-R27	Report Date April 2005	No. Pages 28	Type Report: Final Period Covered: July 1, 2004 to June 30, 2005	Project No. 72788
				Contract No.
Title: Urban Safety Restraint Use by Infants, Preschoolers, and Older Children in Virginia: The 2004 Survey Results				Key Words: Child safety seats, booster seats, safety belt use, child restraint use
Author(s): Cheryl W. Lynn and Jami F. Kennedy				
Performing Organization Name and Address: Virginia Transportation Research Council 530 Edgemont Road Charlottesville, VA 22903				
Sponsoring Agencies' Name and Address				
Virginia Department of Motor Vehicles 2300 West Broad Street Richmond, VA. 23219		Virginia Department of Health Center for Injury and Violence Prevention P.O. Box 2448 Richmond, VA 23218-2448		
Supplementary Notes				
<p>Abstract:</p> <p>In 2004, Virginia's child restraint use survey was conducted in four metropolitan areas of the state (northern, eastern, central, and western) and in four mid-size cities (Charlottesville, Danville, Lynchburg, and Harrisonburg) at the same sites, on the same day of the week, and at the same hour of the day as in previous surveys. The principal goal of the survey is to monitor (1) safety and booster seat use by infants under 4 and preschoolers 4 and 5 years of age, and (2) safety belt use by older children 6 to 16. Each survey estimates compliance with the child restraint law in place at the time. The surveys have been conducted every year since 1983.</p> <p>Changes were made in the 2002 child restraint survey methodology to reflect the changes in the child restraint law. The age categories previously used were changed to (1) infants under 4, (2) preschoolers 4 and 5, and (3) older children 6 to 16. These categories will allow investigators to continue to analyze the longitudinal restraint use data using the previous age categories (infants under 4 and children 4 to 16) and to evaluate the impact of the legislative changes made in 2002. In addition, a more comprehensive picture of restraint use in Virginia can be created by comparing adult restraint use (from Virginia's annual adult restraint survey conducted for the National Highway Traffic Safety Administration) and restraint use for younger passengers.</p> <p>In this survey, safety belt and child safety seat use were divided into three categories: correct use, incorrect use, and nonuse. The definitions of <i>correct use</i> and <i>incorrect use</i> for child safety seats were changed in 2003 to measures that could be consistently determined from outside the vehicle. <i>Incorrect use</i> for children under 6 was defined to include safety seat or lap belt use by a child either too large or too small for that form of restraint. For children 6 to 16, the definition of <i>incorrect use</i> was not changed and included wearing the shoulder belt either behind the back or under the arm. Total use rates defined as correct plus incorrect use are also presented in the report to represent a rate not biased by any remaining variability in the incorrect use category.</p> <p>A total of 2,596 children were observed during the 2004 survey: 375 infants under 4 and 2,221 children 4 to 16. In 2004, total child restraint use for infants in metropolitan areas and in mid-size cities combined was 98.1% and correct use was 92.8%. Total seat belt use among 4 to 16 year olds in metropolitan areas and in mid-size cities combined was 76.0%, and correct use was 65.4%.</p>				

FINAL REPORT

**URBAN SAFETY RESTRAINT USE BY INFANTS, PRESCHOOLERS,
AND OLDER CHILDREN IN VIRGINIA: THE 2004 SURVEY RESULTS**

Cheryl W. Lynn
Senior Research Scientist

Jami F. Kennedy
Associate Research Scientist

Virginia Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the
Virginia Department of Transportation and
the University of Virginia)

Charlottesville, Virginia

April 2005
VTRC 05-R27

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Virginia Department of Transportation, the Commonwealth Transportation Board, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

Copyright 2005 by the Commonwealth of Virginia.

EXECUTIVE SUMMARY

Introduction

The Virginia Transportation Research Council has been tracking the use of child safety restraint systems in Virginia since 1983. Child restraint surveys have been conducted annually (except in 1995) to measure the frequency of use and to make the findings available to state officials. The surveys have varied in detail and scope, but the principal goal has always been to estimate compliance with the relevant statutes in place at the time.

Virginia's original child restraint law was passed in 1982 and required that infants under age 4 use a child safety seat, except for those who weighed at least 40 pounds or were at least 40 inches tall and thus could use a standard safety belt. In 1997, Sections 46.2-1094 and 46.2-1095 of the *Code of Virginia* were changed to require that all children under age 16 use a safety restraint. In 2002, the Virginia General Assembly amended Section 46.2-1095 so that "[a]ny person who drives on the highways of Virginia any motor vehicle manufactured after January 1, 1968, shall ensure that any child, *through age five*, whom he transports therein is provided with and properly secured in a child restraint device of a type which meets the standards adopted by the United States Department of Transportation" [emphasis added]. In addition, Section 46.2-1100 stipulated that "[t]he use of a seat belt . . . shall not violate this article if (i) the affected child is at least four years old but less than six years old and (ii) the weight and size of the child is such as to make the use of such seat belt practical and the use of an approved child restraint impractical."

Changes were made in the 2002 child restraint survey methodology to reflect the changes in the child restraint law. The age categories previously used in the survey were changed to (1) infants under 4, (2) preschoolers 4 and 5, and (3) older children 6 to 16. These categories allowed investigators to continue to analyze the longitudinal restraint use data using the previous age categories (infants under 4 and children 4 to 16) and to evaluate the impact of the legislative changes made in 2002.

In the 2004 child safety restraint survey, observations of safety belt and child safety seat use were placed into three categories: correct use, incorrect use, and nonuse. The definitions of *correct use* and *incorrect use* with regard to child safety seats were changed in 2003 to measures that could be consistently determined from outside the vehicle. *Incorrect use* for children under 6 years of age was defined to include safety seat or lap belt use by a child either too large or too small for that form of restraint. For children 6 to 16 years of age, the definition of *incorrect use* was not changed and included the shoulder belt being worn either behind the back or under the arm. Total use rates (defined as correct use plus incorrect use) are presented in this report to represent a rate not biased by any remaining variability in the incorrect use category.

Findings for 2004

A total of 2,596 children were observed during the 2004 survey: 375 infants under 4 and 2,221 children 4 to 16 years of age. In 2004, total child restraint use for infants in metropolitan areas and mid-size cities combined was 98.1% and correct use was 92.8%. Total seat belt use among 4 to 16 year olds in metropolitan areas and mid-size cities combined was 76.0%, and correct use was 65.4%.

In the metropolitan areas, restraint use for children increased in 2004 (Figure ES-1). Total use for infants increased to 98.1%, and rates for preschoolers increased to around 80%. Use rates for children 6 to 16 rose to 73.7%. Use rates for preschoolers were about 18 points lower than for infants. It is unknown why preschool passengers are restrained less often than are infants, but this needs to be determined.

As seen in Figure ES-2, a similar pattern was noted in mid-size cities, with infants having the highest total rate (98.1%), followed by preschoolers (84.7%) and older children 6 to 16 (74.6%). The total use rate for infants was 14 points higher than for preschoolers. Why this disparity occurs is uncertain.

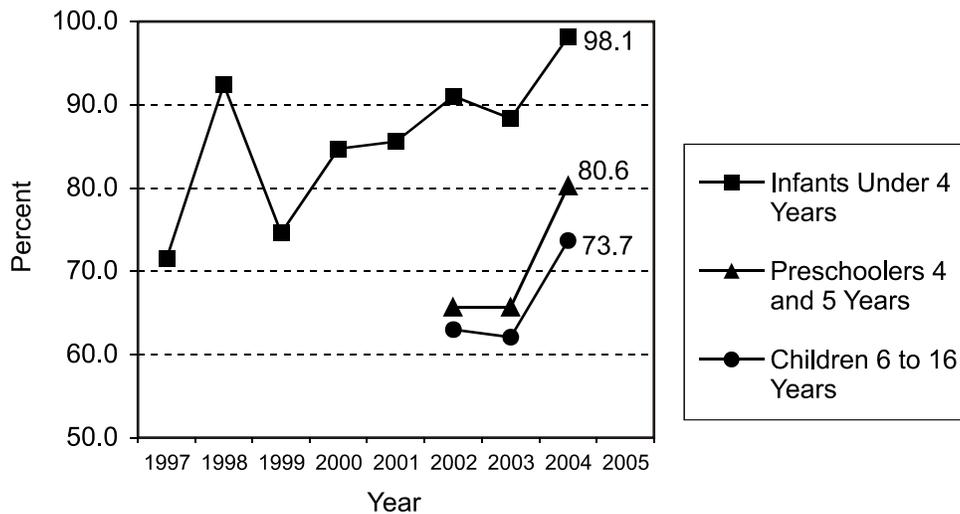


Figure ES-1. Total Restraint Use Rates for Children in Metropolitan Areas (1996-2004)

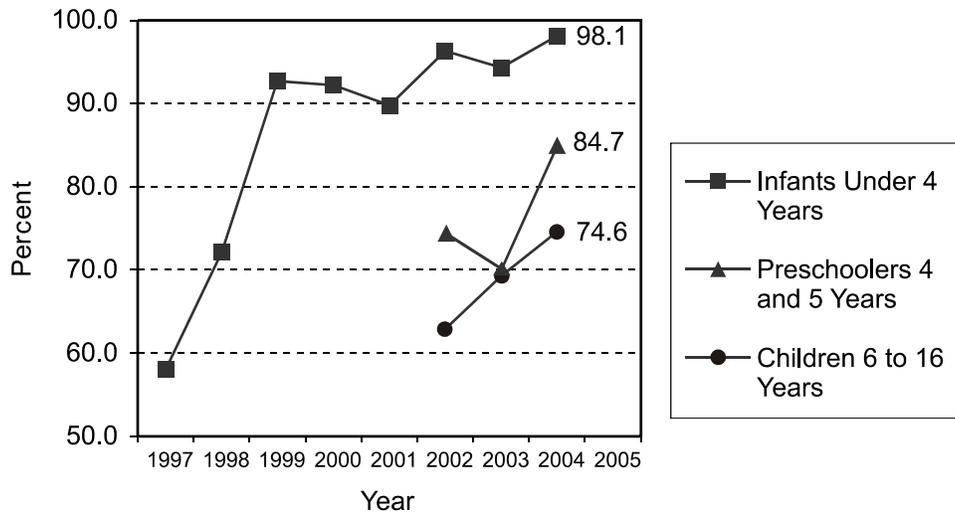


Figure ES-2. Total Restraint Use Rates for Children in Mid-Size Cities (1997-2004)

Recommendation

VDH should consider taking actions toward increasing driver compliance with restraint laws for preschoolers 4 and 5 years old and older children 6 to 16.

Such programs could include:

1. *Establishing (perhaps in conjunction with the Governor's office) a multidisciplinary task force to study and make recommendations concerning methods to increase safety restraint use among children under 16.*
2. *Increasing penalties for non-compliance with current restraint laws:* The current fine for non-compliance is \$25. This fine might not be a sufficient disincentive and perhaps does not send the message that not restraining children is a serious problem with possibly dire consequences. Increasing penalties would require legislative action. Consideration might be given to having a portion of the fine set aside for programs regarding children and motor vehicle safety.
3. *Increasing the level of enforcement:* By statute, primary enforcement can be used with regard to child restraint use. This means that officers can pull over a driver solely for failure to have children properly restrained, and in a checkpoint situation, can ticket the driver. Because Virginia already has a primary safety belt law in place for children, consideration could also be given to establishing checkpoints to aid in enforcement.
4. *Increasing public awareness of the vulnerability of unrestrained preschoolers and older children:* If the failure to restrain children is due to an incorrect assumption that preschoolers and older children are not as likely as infants to be injured in a

crash, educating drivers with regard to the number and likelihood of serious injuries among these age groups might improve use and establish restraint use as a habit among older children prior to their licensing at age 16.

5. *Establishing a new offense:* Legislation could be passed establishing a new offense of “child endangerment by motor vehicle” in cases where children are unrestrained in a vehicle in which the driver has committed a moving violation.

Benefits Assessment

The results of the child safety restraint surveys enable VDH to develop and promote legislative, administrative, and public awareness countermeasures that more precisely target obstacles to increased belt and safety seat use by children.

By targeting at-risk preschoolers and older children, VDH might be able to increase restraint use rates, thereby reducing childhood mortality and morbidity by reducing the injury-related consequences of crashes.

FINAL REPORT

URBAN SAFETY RESTRAINT USE BY INFANTS, PRESCHOOLERS, AND OLDER CHILDREN IN VIRGINIA: THE 2004 SURVEY RESULTS

Cheryl W. Lynn
Senior Research Scientist

Jami F. Kennedy
Associate Research Scientist

INTRODUCTION

The Virginia Transportation Research Council has been tracking the use of child safety restraint systems since 1983. Child restraint surveys have been conducted annually (except in 1995) to measure the frequency of use and to make the findings available to state officials. The surveys have varied in detail and scope, but the principal goal has always been to estimate compliance with the relevant statutes in place at the time. The surveys from 1983 through 1996 were conducted at the request of officials of Virginia's Department of Motor Vehicles. With the transfer of responsibility for the state's child restraint program to the Virginia Department of Health (VDH) in 1997, that agency requested that the surveys be continued.

Because the sites used in the survey were not selected randomly, the survey results cannot be used as estimates of statewide infant and child restraint use. However, these child restraint surveys provide a snapshot of child restraint use at the urban and mid-size city survey sites. Taken together, they provide safety program administrators and public health officials an indication of changes in use rates over time and identify low use groups that can be targeted by future restraint use countermeasures.

BACKGROUND

Virginia's original child restraint law was passed in 1982 and required that infants under 4 years of age use a child safety seat, except for those who weighed at least 40 pounds or were at least 40 inches tall, and thus could use a standard safety belt. In 1997, Sections 46.2-1094 and 46.2-1095 of the *Code of Virginia* were changed to require that all children under age 16 use safety restraints. In 2002, the legislature amended Section 46.2-1095 so that "[a]ny person who drives on the highways of Virginia any motor vehicle manufactured after January 1, 1968, shall ensure that any child, *through age five*, whom he transports therein is provided with and properly secured in a child restraint device of a type which meets the standards adopted by the United States Department of Transportation" [emphasis added]. In addition, Section 46.2-1100 stipulated that "[t]he use of a seat belt . . . shall not violate this article if (i) the affected child is at least four years old but less than six years old and (ii) the weight and size of the child is such as to make the use of such seat belt practical and the use of an approved child restraint impractical."

PURPOSE AND SCOPE

The principal goal of this child restraint survey was to estimate compliance with the relevant statutes so that the VDH can evaluate previous efforts to increase restraint use and develop new programs for target audiences.

METHODS

The method used for the 2004 child restraint survey was the same as that used in previous surveys. Data were collected from four metropolitan areas of Virginia (northern, eastern, central, and western) at the same sites, on the same day of the week, and at the same hour of the day as in previous summers. As in previous surveys, data were collected at signalized intersections at 12 sites in the northern area (Fairfax County, Arlington, and Alexandria), 11 in the eastern area (Norfolk, Virginia Beach, and Newport News), 7 in the central area (Richmond, Henrico, and Chesterfield), and 4 in the western area (Roanoke, Salem, and Vinton). Data were also collected at 8 sites in Danville, 9 in Lynchburg, 6 in Charlottesville, and 6 in Harrisonburg. This reflects an increase in the sample size in the original three mid-size cities and the addition of Harrisonburg as the fourth mid-size city. The increases in sample size allow more reliable and valid estimates of child restraint use. The reader should keep in mind that these sites were not selected randomly; rather, they were selected to maximize the probability of observing children in motor vehicles. Thus, high-volume intersections in each metropolitan area and mid-size city were targeted for inclusion in the sample. For this reason, the rates cited in this report do not represent the total population of children in Virginia.

Data were collected on occupants of passenger cars, small sport utility vehicles (SUVs), and small vans in the curb travel lane, and no distinction was made between Virginia-registered and out-of-state vehicles (the law makes no such distinction). When vehicles stopped for a red signal, the observers left the curb and approached the vehicle from the passenger-side front fender. Each team member observed up to 15 vehicles per traffic light cycle. The safety of the observer (staying clear of entrances to businesses) and the volume of traffic determined the number of vehicles surveyed. At some intersections, it was possible to observe only five vehicles because of the signal timing or vehicle volume at the site. Because of the increasing prevalence of window tinting, especially on SUVs and minivans, it was impossible to determine whether children were using safety restraints in the rear seats in these instances. In such cases, front seat observations were included in the survey and rear seat observations were not.

As required by state policy, each team member wore a hard hat and an orange safety vest. Data were collected during 1-hour periods between 7:30 and 4:00 P.M. Two persons comprised the survey team—each working on a different leg of the intersection, each trained on the data collection protocol described here, and each trained on how to identify the factors that constitute correct and incorrect use.

According to the *Code of Virginia*, as of 2002, children under 6 years of age are required to use child safety seats and children aged 6 to 16 are required to use safety belts. (The *Code*

allows larger children 4 and 5 years of age to move from safety seats or booster seats to safety belts if it is impractical for them to use child safety seats.) (Prior to 2002, children under 4 years of age were required to use child safety seats and children aged 4 to 16 were required to use safety belts.) Thus, beginning with the 2002 survey, instead of two age categories, three were used: (1) infants under 4 years, (2) preschoolers 4 and 5 years old, and (3) older children 6 to 16 years. This change was necessary, since each child safety restraint survey is designed to measure compliance with the restraint laws in effect at the time.

The data collectors were trained to discriminate among infants under age 4, preschoolers aged 4 and 5, and older children aged 6 to 16. Data collectors were taken to shopping malls, toy stores, parking lots, and other areas where children were likely to be present and asked to guess the age and weight of young children. The supervisor then approached the adult accompanying the child; explained the survey; and asked for the actual age, height, and weight of the child. Thus, data collectors were able to learn from their successes and failures to identify which age group was appropriate for each child. Training continued until each data collector was consistently able to identify each age group correctly, independent of the other observers. During the 2004 survey, this portion of the data collector training took less than 8 hours, since all data collectors had worked on previous surveys.

On the data collection form, an *I* for infant was used for those under age 4, a *PS* for preschooler was used for those aged 4 and 5, and a *C* for child was used for those aged 6 to 16. An *SS* was used to designate a child safety seat, and an *L* was used to designate lap/shoulder belts. No attempt was made to distinguish between child safety seats and booster seats, as the law makes no such distinction. (See Figure 1 for the data collection form used in 2004.)

In this survey, the observations of safety belt and child safety seat use were placed into three categories for purposes of analysis: correct use, incorrect use, and nonuse. The definitions of *correct use* and *incorrect use* for child safety seats were changed in 2003 to measures that could be consistently determined from outside the vehicle. *Incorrect use* for children under age 6 was defined to include safety seat or lap belt use by a child either too large or too small for that form of restraint. For children aged 6 to 16, the definition of *incorrect use* was not changed and included the shoulder belt being worn either behind the back or under the arm. In addition, total use rates defined as correct plus incorrect use are presented in the report to represent a rate not biased by any remaining variability in the incorrect use category.

RESULTS

The longitudinal analysis presented in this report is similar to those presented in previous years in that the age categories focused on are infants under 4 years of age and children 4 to 16 years of age. Since data for the three age categories mentioned in the 2002 legislation (infants, preschoolers and older children) had been collected only 3 years, only a small part of the analysis was devoted to these three groups.

CHILD SAFETY SEAT SURVEY

Summer 2004

Area _____ Site _____ @ _____ Sheet # _____

1 2 3 4 5

6 7 8 9 10

Back Seats Not Visible

I = Infant under 4 yrs. P = Preschool 4 and 5 yrs. Child = 6 to 16 yrs. SS = Safety seat L = Lap/Shoulder

Usage: I = Incorrect C = Correct N = Nonuse

Figure 1. Data Collection Form

During the 2004 survey, 375 infants under age 4 and 2,221 children 4 to 16 years of age were observed (see Tables 1 and 2). Since drivers are discouraged by safety advocates from carrying infants and small children in the front seat because the deployment of airbags can result in severe injury to young children, the seating position was noted for each observation. In 2004, the percentage of infants seated in the front seat continued to decrease in the metropolitan areas. However, in two mid-size cities, Lynchburg and Danville, the percentage increased. In Lynchburg, the increase was small, but in Danville, the increase was from 5.6% in 2003 to 10% in 2004. For children aged 4 to 16, front seat occupancy remained in the low-to-mid 40% range in both metropolitan areas and mid-size cities. (Sample sizes for preschoolers 4 and 5 years old and older children 6 to 16 years old are provided in the Appendix.)

Table 1. Sample Size for Infants Under 4 Years Old for the 1997 through 2004 Surveys by Area and Seat Location

Area/Location	1997		1998		1999		2000		2001		2002		2003		2004	
	No.	%														
Total Metro	484		386		46		215		417		361		191		213	
Front	95	19.6	28	7.3	23	6.6	26	12.1	23	5.5	21	5.8	9	4.7	5	2.3
Rear	389	80.4	358	92.7	323	93.4	189	87.9	394	94.5	340	94.2	182	95.3	208	97.7
<i>Northern</i>	151		128		133		60		160		152		77		96	
Front	26	17.2	3	2.3	8	6	7	11.7	7	4.3	6	3.9	2	2.6	2	2.1
Rear	125	82.8	125	97.7	125	94	53	88.3	153	95.7	146	96.1	75	97.4	94	97.9
<i>Eastern</i>	213		148		109		59		140		106		46		58	
Front	39	18.3	16	10.8	10	9.2	9	15.3	8	5.7	7	6.6	2	4.3	2	3.4
Rear	174	81.7	132	89.2	99	90.8	50	84.7	132	94.3	99	93.4	44	95.7	56	96.6
<i>Central</i>	92		69		71		68		76		63		42		37	
Front	22	23.9	5	7.2	2	2.8	4	5.9	4	5.3	6	9.5	4	9.5	0	0.0
Rear	70	76.1	64	92.8	69	97.2	64	94.1	72	94.7	57	90.5	38	90.5	37	100.0
<i>Western</i>	28		41		33		28		41		40		26		22	
Front	8	28.6	4	9.8	3	9.1	6	21.4	4	9.8	2	5	1	3.8	1	4.5
Rear	20	71.4	37	90.2	30	90.9	22	78.6	37	90.2	38	95	25	96.2	21	95.5
Total Mid-Size	81		86		123		64		108		254		162		162	
Front	12	14.8	13	15.1	11	8.9	14	21.9	11	10.2	17	6.7	11	6.8	8	4.9
Rear	69	85.2	73	84.9	12	91.1	50	78.1	97	89.8	237	93.3	151	93.2	154	95.1
<i>Danville</i>	21		20		34		15		27		46		36		40	
Front	4	19	4	20	7	20.6	6	40	3	11.1	8	17.4	2	5.6	4	10.0
Rear	17	81	16	80	27	79.4	9	60	24	88.9	38	82.6	34	94.4	36	90.0
<i>Charlottesville</i>	29		47		52		24		41		85		41		36	
Front	3	10.3	7	14.9	1	1.9	1	4.2	2	4.9	6	7.1	1	2.4	0	0.0
Rear	26	89.7	40	85.1	51	98.1	23	95.8	39	95.1	79	92.9	40	97.6	36	100.0
<i>Lynchburg</i>	31		19		37		25		40		82		55		67	
Front	5	16.1	2	10.5	3	8.1	7	28	6	15	2	2.4	3	5.5	4	6.0
Rear	26	83.9	17	89.5	34	91.9	18	72	34	85	80	97.6	52	94.5	63	94.0
<i>Harrisonburg</i>											41		30		19	
Front											1	2.4	5	16.7	0	0.0
Rear											40	97.6	25	83.3	19	100.0

**Table 2. Sample Size for Children 4 to 16 Years Old for the 1997 through 2004 Surveys
by Area and Seat Location**

Area/Location	1997		1998		1999		2000		2001		2002		2003		2004	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Metro	1593		1106		1026		698		1058		1280		1205		1299	
Front	761	47.8	340	30.7	359	35	261	37.4	437	41.3	430	33.6	492	40.8	541	41.6
Rear	832	52.2	766	69.3	667	65	437	62.6	621	58.7	850	66.4	713	59.2	758	58.4
<i>Northern</i>	459		342		367		177		360		459		436		441	
Front	212	46.2	83	24.3	121	33	47	26.6	131	36.4	133	29	142	32.6	158	35.8
Rear	247	53.8	259	75.7	246	67	130	73.4	229	63.6	326	71	294	67.4	283	64.2
<i>Eastern</i>	694		442		328		152		351		372		368		412	
Front	336	48.4	114	25.8	113	34.5	49	32.2	153	43.6	154	41.4	160	43.5	192	46.6
Rear	358	51.6	298	67.4	215	65.5	103	67.8	198	56.4	218	58.6	208	56.5	220	53.4
<i>Central</i>	297		224		229		297		214		313		297		305	
Front	145	48.8	77	34.4	81	35.4	138	46.5	98	45.8	93	29.7	135	45.5	127	41.6
Rear	152	51.2	147	65.6	148	64.6	159	53.5	116	54.2	220	70.3	162	54.5	178	58.4
<i>Western</i>	143		98		102		72		133		136		104		141	
Front	68	47.6	36	36.7	44	43.1	27	37.5	55	41.4	50	36.8	55	52.9	64	45.4
Rear	75	52.4	62	63.3	58	56.9	45	62.5	78	58.6	86	63.2	49	47.1	77	54.6
Total Mid-Size	385		289		247		179		287		949		894		922	
Front	179	46.5	85	29.4	104	42.1	56	31.3	131	45.6	387	40.8	379	42.4	391	42.4
Rear	206	53.5	204	70.6	143	57.9	123	68.7	156	54.4	562	59.2	515	57.6	531	57.6
<i>Danville</i>	98		77		70		41		67		259		222		241	
Front	42	42.9	18	23.4	30	42.9	7	17.1	28	41.8	109	42.1	97	43.7	102	42.3
Rear	56	57.1	59	76.6	40	57.1	34	82.9	39	58.2	150	57.9	125	56.3	139	57.7
<i>Charlottesville</i>	152		114		94		82		90		196		188		198	
Front	72	47.4	30	26.3	39	41.5	33	40.2	43	47.8	67	34.2	65	34.6	75	37.9
Rear	80	52.6	84	73.7	55	58.5	49	59.8	47	52.2	129	65.8	123	65.4	123	62.1
<i>Lynchburg</i>	135		98		83		56		130		327		324		305	
Front	65	48.1	37	37.8	35	42.2	16	28.6	60	46.2	128	39.1	138	42.6	135	44.3
Rear	70	51.9	61	62.2	48	57.8	40	71.4	70	53.8	199	60.9	186	57.4	170	55.7
<i>Harrisonburg</i>											167		160		178	
Front											83	49.7	79	49.4	79	44.4
Rear											84	50.3	81	50.6	99	55.6

In 2004, total child restraint use among infants in metropolitan areas and mid-size cities combined was 98.1% and correct use was 92.8%. Total seat belt use among 4 to 16 year olds in metropolitan areas and mid-size cities combined was 76.0%, and correct use was 65.4%. These use rates were calculated by combining the observations for metropolitan areas and mid-size cities and weighting each observation the same, even though observations in mid-size cities accounted for a higher proportion of the population than did those in the metropolitan areas.

Child Restraint Use in Metropolitan Areas

As seen in Figure 2, total and correct restraint use rates for infants in metropolitan areas had a similar pattern between 1993 and 1999, but in 2001 and 2002, correct use dropped to 69.5% and 68.4%, respectively, whereas total use continued to increase. As in previous years, almost the entire drop in the correct use rates was accounted for by a 13-point increase in incorrect use. This, together with the fact that the level of incorrect use has varied from 0% to 20% over the years without any trends, indicates that much of the variation in correct use may be the result of random or data collector variation. By 2004, correct use for infants in metropolitan areas had risen to 93.4% and total use had risen to 98.1%.

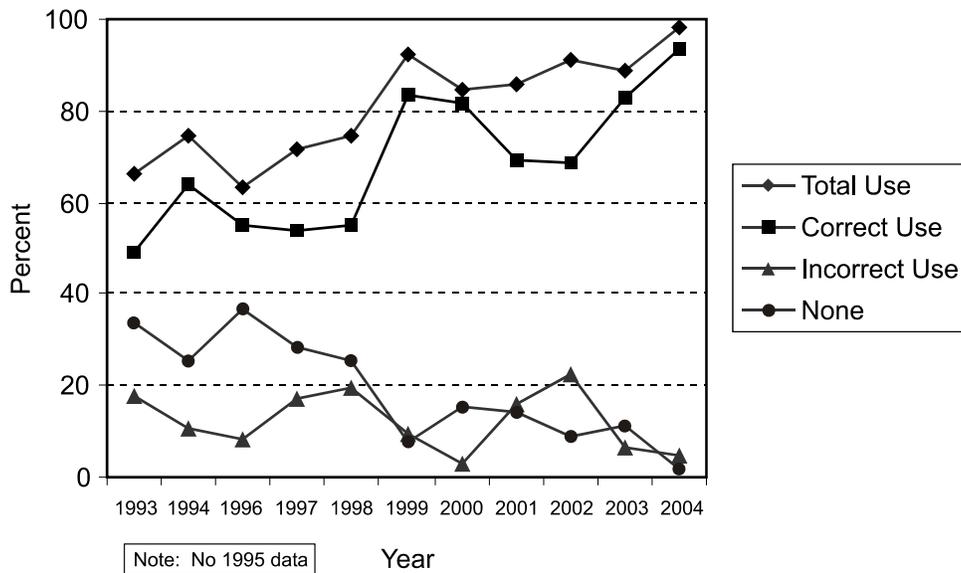


Figure 2. Restraint Use Rates for Infants under Age 4 in All Metropolitan Areas (1993-2004)

In 2004, only 10 infants were using a child safety seat that was inappropriate for their age, height, or weight. No children in this age group were observed using lap belts inappropriately. As seen in Figure 3, the eastern, western, and central metropolitan areas of the state had a 100% total use rate, with correct use rates ranging from 94% to 98%. Only the northern area had lower total and correct use rates, at 95.8% and 90.6%, respectively. The highest level of incorrect use occurred in the northern and eastern areas (5.2%), but the reader must remember that these percentages are based on a total of 10 children and thus, must be interpreted with caution.

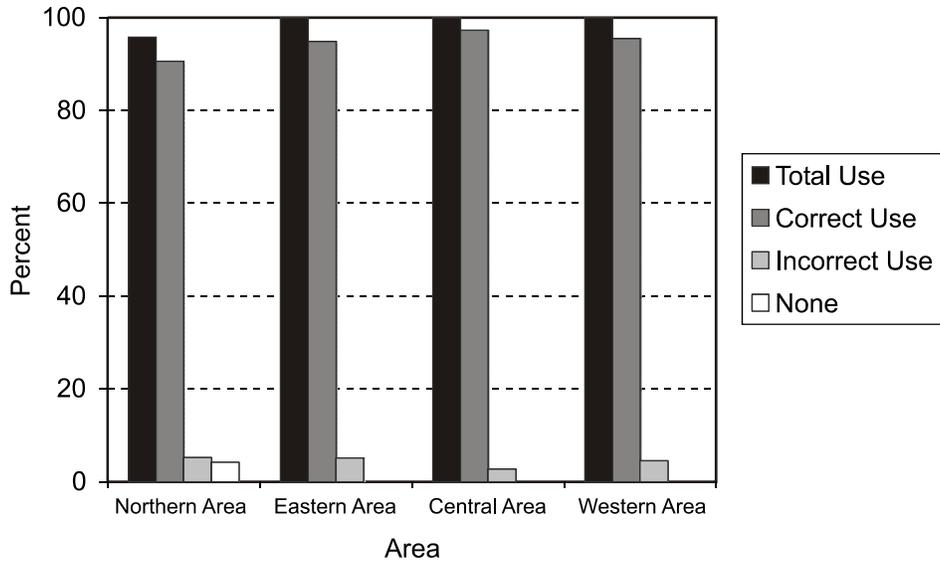


Figure 3. 2004 Restraint Use Rates for Infants under Age 4 by Metropolitan Area

Child Restraint Use in Mid-Size Cities

Child restraint use rates among infants in mid-size cities followed a pattern similar to that for metropolitan areas (Figure 4). Until 2001, both total use and correct use increased, with variations in correct and incorrect use generally cancelling each other out. Although correct use decreased in 2001 and 2002, it rebounded in 2003 and 2004. In 2004, total use rates for all mid-size cities remained high at 98.1% and correct use increased to 93.1%, in part because of the redefinition of the incorrect use category for infants. Of the 10 infants using restraints improperly, 8 were in child safety seats and 2 were using lap and shoulder belts.

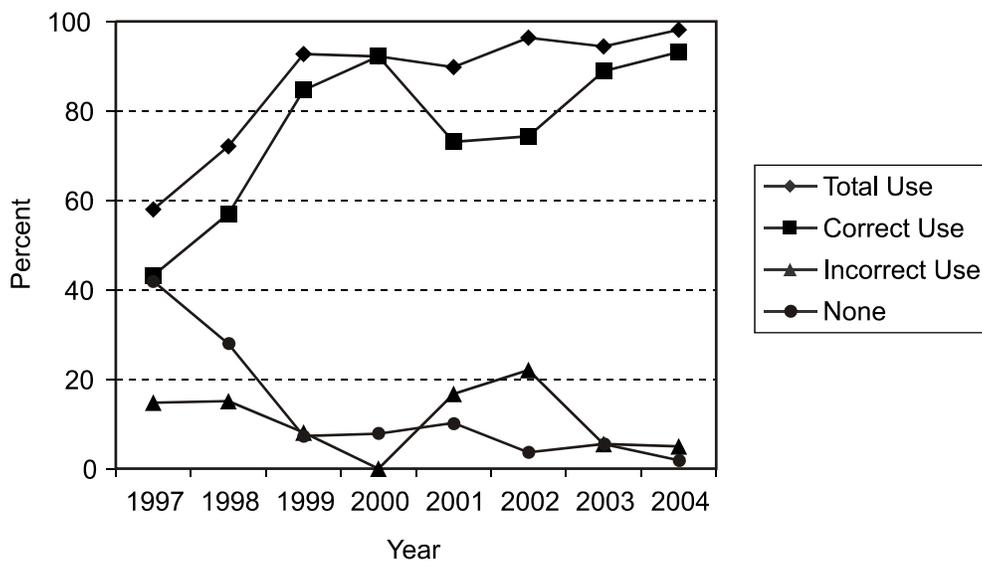


Figure 4. Restraint Use Rates for Infants under Age 4 for All Mid-Size Cities (1997-2004)

As seen in Figure 5, total use rates for 2004 were 100% in Charlottesville (for the third year in a row), Harrisonburg, and Lynchburg. Correct use rates were also 100% in Charlottesville and Harrisonburg, and the lowest correct use rate was in Danville (82.5%). Danville also had the highest incorrect use rate (10.0%). Again, these results are based on a very small sample size.

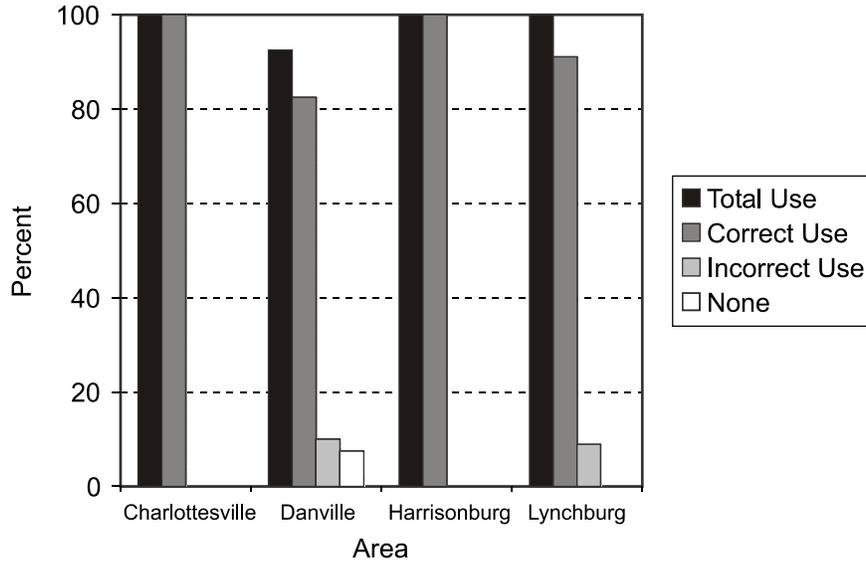


Figure 5. 2004 Restraint Use Rates for Infants under Age 4 by Mid-Size City

Restraint Use Among 4 to 16 Year Olds in Metropolitan Areas

In the 2004 survey, 1,299 occupants 4 to 16 years of age were observed in the metropolitan areas. The total restraint use rate for this age group increased from 49.2% in 1997 (when belt use was mandated for this group) to 75.4% in 2004 (Figure 6); correct use was 63.0%,

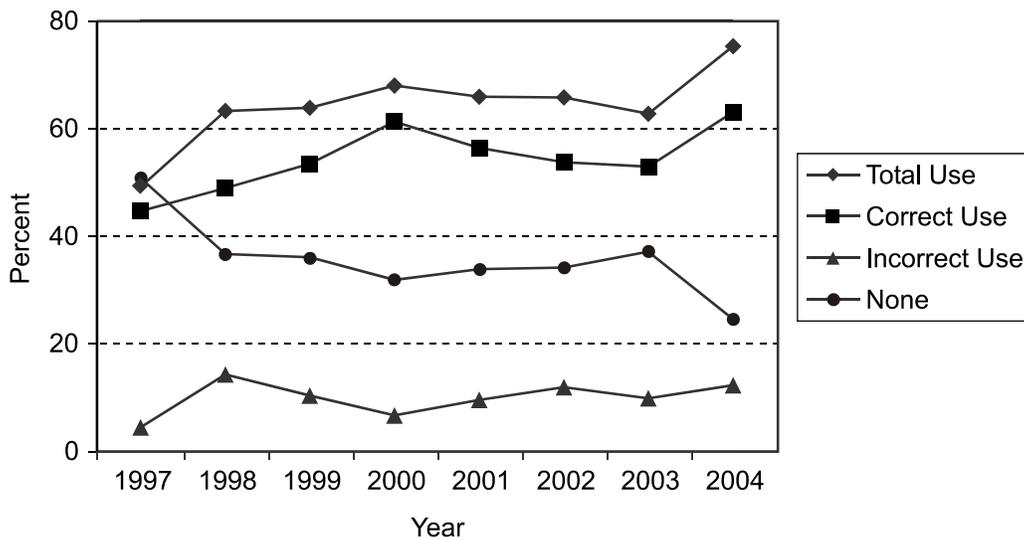


Figure 6. Restraint Use Rates for 4 to 16 Year Olds in Metropolitan Areas (1997-2004)

the highest it has been since the law was enacted. Incorrect use was just over 12%. Six children were found to be using safety seats when this was inappropriate for their weight and height, and 154 were using safety belts when their weight and height indicated they should still be using child safety seats or were not using safety belts correctly.

As seen in Figure 7, 2004 total and correct seat belt use rates were highest in the western and eastern areas. Correct use was lowest in the central area, at 59.7%.

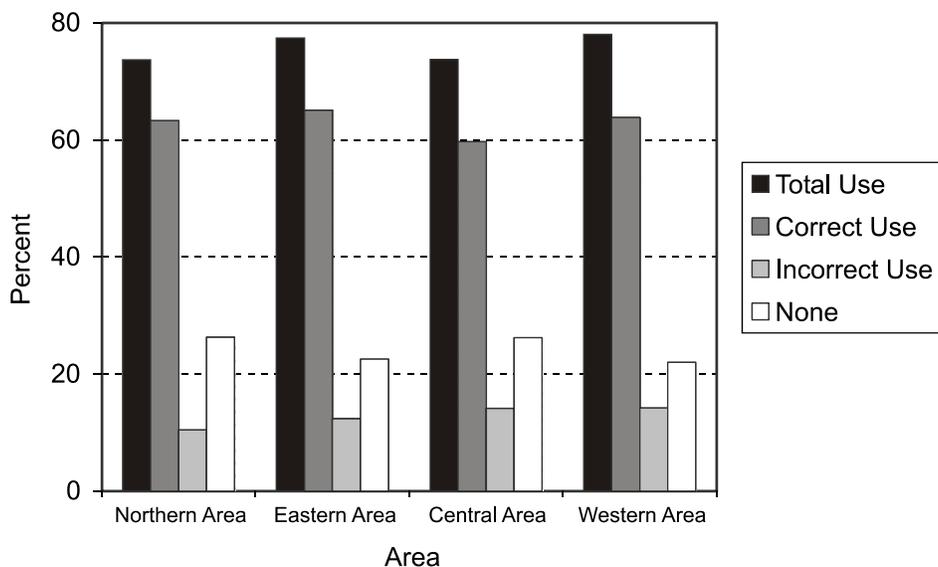


Figure 7. 2004 Restraint Use Rates for 4 to 16 Year Olds by Metropolitan Area

Front Seat vs. Rear Seat Restraint Use in Metropolitan Areas

In 1997, changes in Sections 46.2-1094 and 46.2-1095 of the *Code* required that rear seat occupants aged 4 to 16 use safety restraints. Since this change became effective July 1, 1997, an increase in rear seat restraint use disproportionate to an increase in front seat use would be expected beginning in 1997.

As seen in Figure 8, total metropolitan use rates for 4 to 16 year olds in the rear seats were consistently lower than for children in the front seats, but in 2004, rear seat use increased dramatically. The 2004 total use rate in the front seat was 79.3%, whereas the total use rate in the rear seat increased to 72.6%. In 2003, the discrepancy between total front and rear use was about 16 points. By 2004, the discrepancy had declined to 6.7 points. A similar trend was noted with regard to correct use: correct rear seat use rates were 16 points lower than correct front seat use rates in 2003. This difference declined to 8.5 points in 2004, with correct use increasing to 68.0% in the front seat compared to 59.5% in the rear seat (Figure 9).

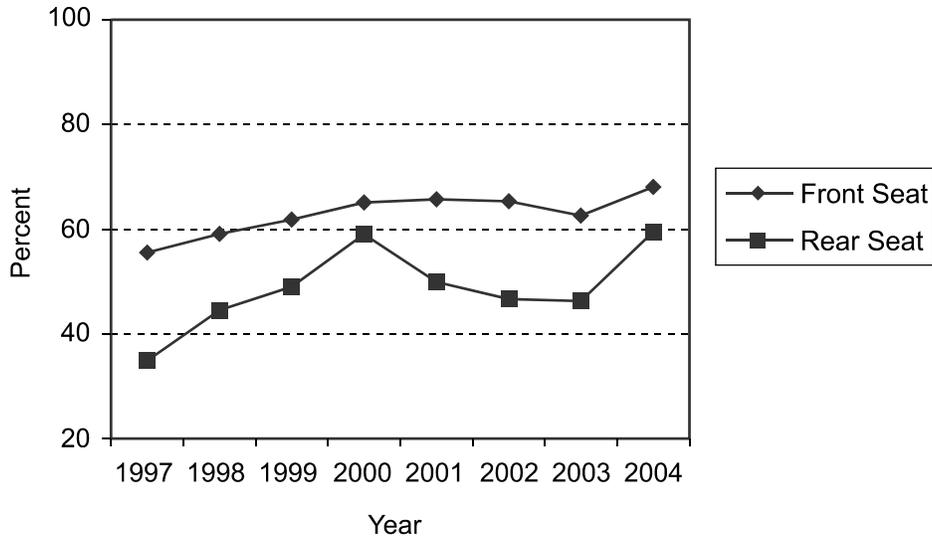


Figure 8. Total Restraint Use Rates for 4 to 16 Year Olds in Metropolitan Areas: Front Seat vs. Rear Seat (1997-2004)

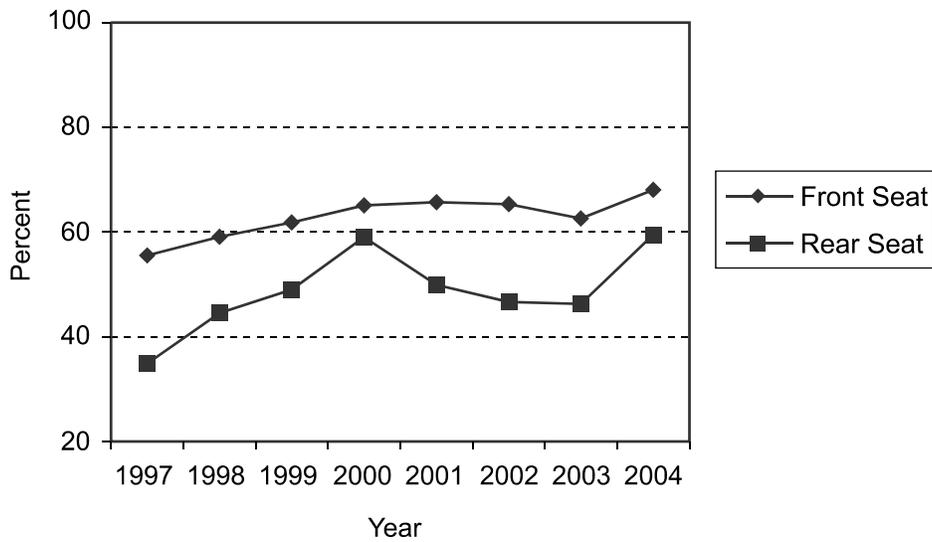


Figure 9. Correct Restraint Use Rates for 4 to 16 Year Olds in Metropolitan Areas: Front Seat vs. Rear Seat (1997-2004)

Restraint Use Among 4 to 16 Year Olds in Mid-Size Cities

After several years where safety belt use rates for 4 to 16 year olds varied only slightly, the 2004 total and correct use figures increased significantly. For children in mid-size cities, total and correct use rose to 81.4% and 77.8%, respectively (Figure 10). A small percentage of the increase was due to changes in incorrect belt use, all of which occurred among safety belt users who were too young or too small for belt use.

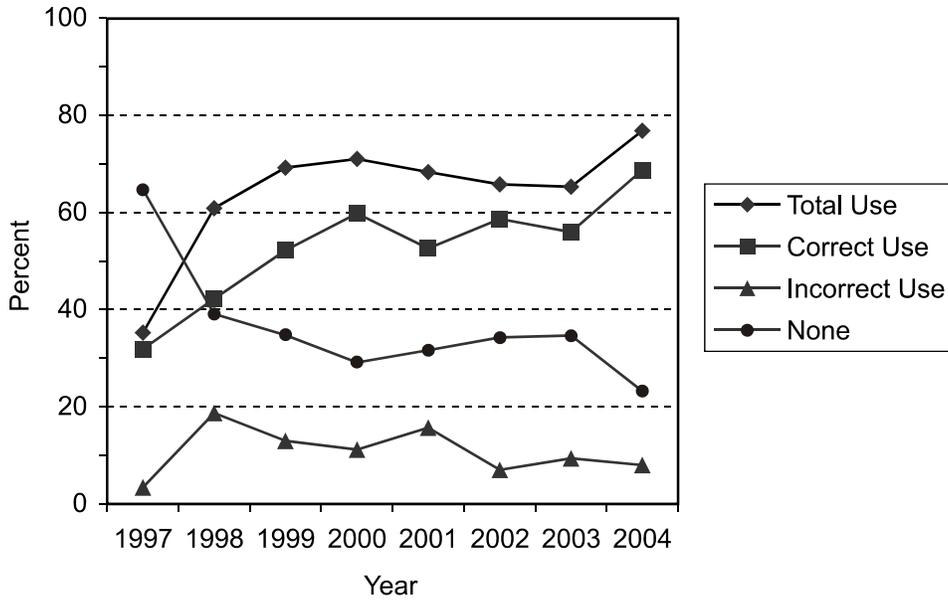


Figure 10. Restraint Use Rates for 4 to 16 Year Olds in Mid-Size Cities (1997-2004)

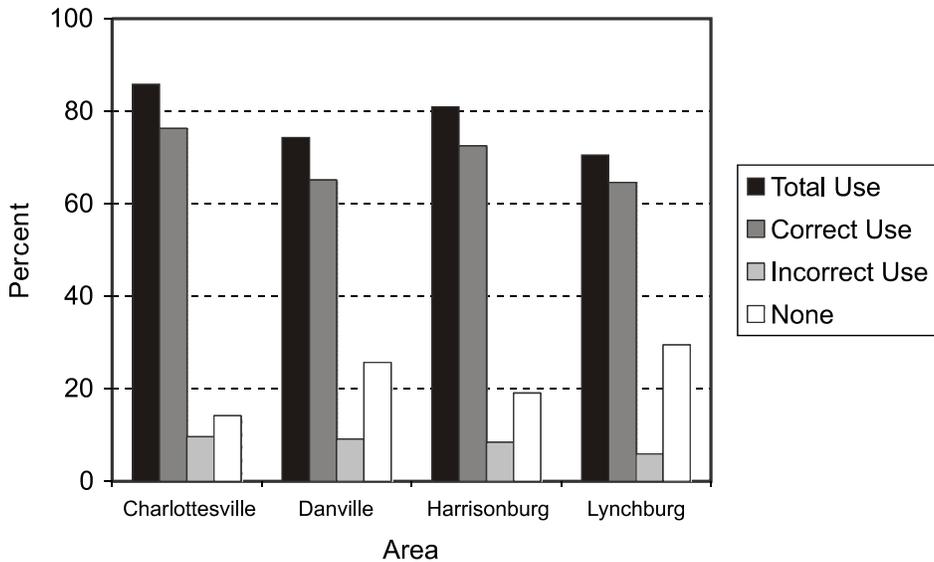


Figure 11. 2004 Restraint Use Rates for 4 to 16 Year Olds by Mid-Size City

As seen in Figure 11, the total 2004 use rates varied from 70.5% in Lynchburg to 85.9% in Charlottesville, with Harrisonburg having the second highest rate of 80.9%. Correct use was also highest in Charlottesville and Harrisonburg (76.3% and 72.5%) and lowest in Lynchburg (64.6%).

Front Seat vs. Rear Seat Restraint Use

The total and correct restraint use rates for front and rear seat occupants 4 to 16 years old in the mid-size cities are shown in Figures 12 and 13, respectively. As was the case in

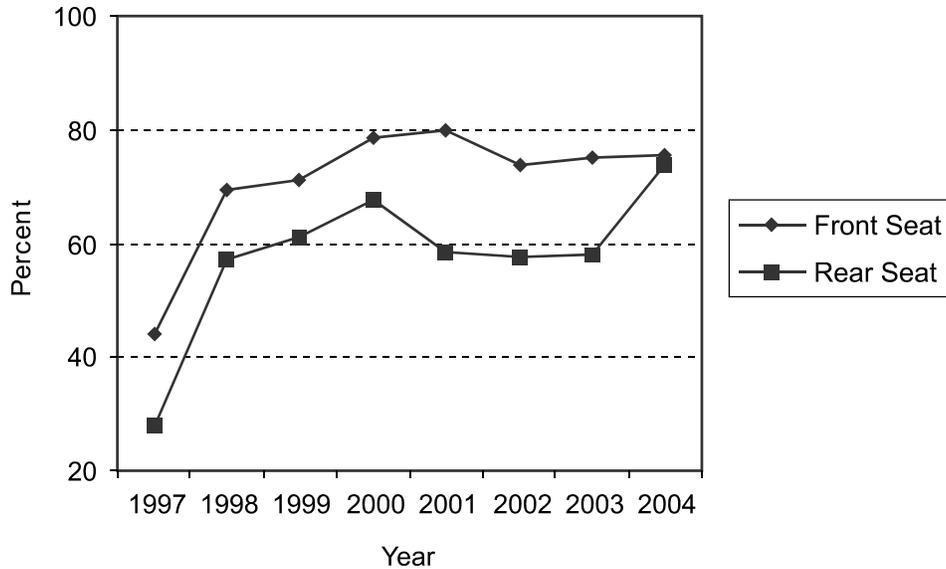


Figure 12. Total Restraint Use Rate for 4 to 16 Year Olds in Mid-Size Cities: Front Seat vs. Rear Seat (1997-2004)

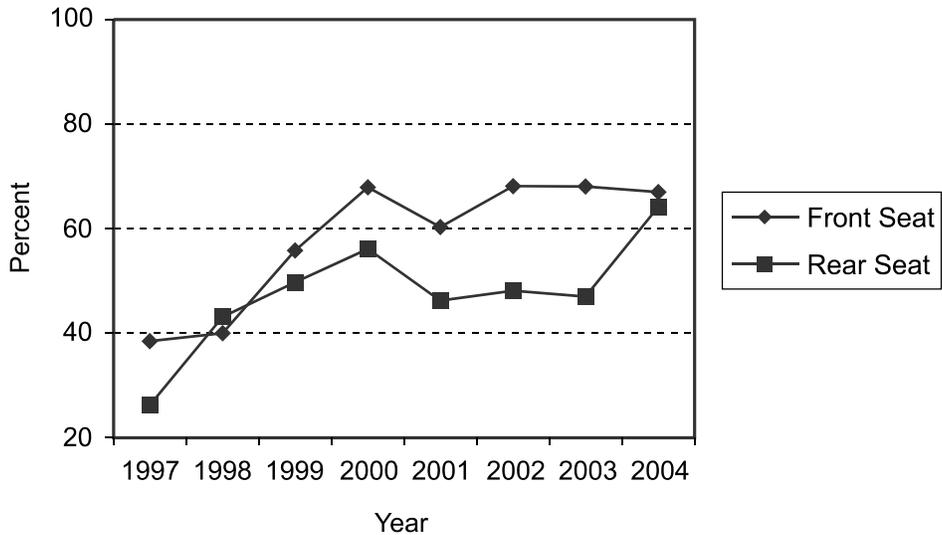


Figure 13. 2004 Correct Restraint Use Rates for 4 to 16 Year Olds in Mid-Size Cities: Front Seat vs. Rear Seat (1997-2004)

metropolitan areas, legislatively mandated rear seat belt use was consistently lower than front seat belt use until 2004, when rear seat use increased to 75.5%, almost equaling front seat use (76.8%).

A similar pattern was seen in terms of correct restraint use in mid-size cities. Correct front seat and rear seat use rates were both very low in the late 1990s (38.5% and 26.2%, respectively). Correct front seat use was higher than rear seat use until 2004, when rear seat use increased to 67.0%, almost equaling the front seat use rate of 68.8%.

Comparison of Infant, Preschooler, and Older Children Safety Restraint Use

Metropolitan Areas

Metropolitan restraint use data for infants, preschoolers, and older children are presented in Figure 14. The restraint use rate for all four age groups increased in 2004. Use of child safety and booster seats by infants increased to 98.1%. Use by preschoolers increased to 80.6%. However, the use rate for preschoolers was well below the rate for infants. The use rate for older children increased in 2004.

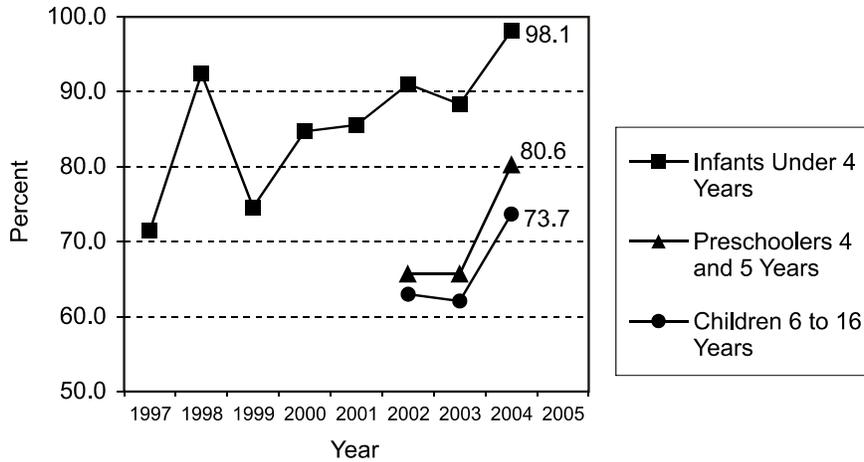


Figure 14. Total Restraint Use Rates for Children in Metropolitan Areas (1996-2004)

Mid-Size Cities

Similar findings were noted for mid-size cities (Figure 15). Use rates for preschoolers (84.7%) were significantly less than rates for infants (98.1%). However, preschooler use rates were somewhat higher than in the metropolitan areas. Use rates for older children were commensurately low in both mid-size cities and metropolitan areas. Again, the reasons for the disparity are not known.

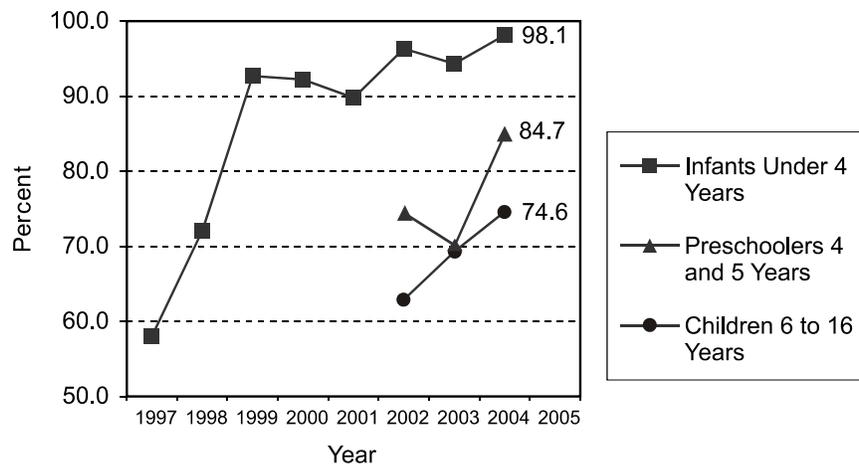


Figure 15. Total Restraint Use Rates for Children in Mid-Size Cities (1997-2004)

MAJOR FINDINGS FOR 2004

The reader is again cautioned that this study was conducted in traffic and, thus, that the data are based on only those use factors that could be verified from outside the stopped vehicle. Because of the increasing prevalence of window tinting, especially on SUVs and minivans, the restraint use of the number of children seated in the rear of the vehicle could not always be determined. In addition, the reader is alerted to the relatively small number of observations of infants, especially in the mid-size cities, and reminded that minor changes in the counts can result in large changes in percentages.

A total of 2,596 children were observed during the 2004 survey: 375 infants under age 4 and 2,221 children aged 4 to 16 years. The 2004 total child restraint use for infants in metropolitan areas and mid-size cities combined was 98.1% and correct use was 92.8%. The 2004 total seat belt use among 4 to 16 year olds in metropolitan areas and mid-size cities combined was 76.0%, and correct use was 65.4%.

Safety Restraint Use by Infants Under Age 4

In Metropolitan Areas

- The proportion of infants seated in the front seat decreased from 19.6% in 1997 to 2.3% in 2004.
- All four metropolitan areas had a lower proportion of infants in front seats in 2004 than in 1997, with 2004 rates varying from 0% (central) to 4.5% (western).
- Total restraint use rate in metropolitan areas for infants was 98.1%. This is the highest infant restraint use rate since 1985, when these child restraint surveys were begun. The correct use rate for infants in metropolitan areas was 93.4%.

In Mid-Size Cities

- The proportion of infants in the front seat was 4.9%, less than in any previous year. Charlottesville and Harrisonburg had no infants in the front seat, and Danville had the highest proportion of infants in the front seat at 10.0%.
- The total use rates for infants rose to a high of 98.1%. Correct use increased to 93.1%. This increase may have been due in part to changes made in the definition of *incorrect use* for infants under 4 to measures that could be consistently identified from outside the vehicle, such as the use of a lap belt or a safety seat too large or too small for the size of the child.
- Total restraint use was 100% in all mid-size cities except Danville, where total use was 92.5%.

Safety Restraint Use by Children 4 to 16 Years of Age

In Metropolitan Areas

- When the data for the four metropolitan areas were combined, 41.6% of these occupants were in the front seats.
- The total metropolitan use rate increased to 75.4%, and correct use followed the same pattern, increasing to 63.0%, both the highest since the beginning of these surveys.
- The western metropolitan area had the highest total use rate for these occupants at 78.0%, and the northern and central areas tied for the lowest, with 73.7% and 73.8%, respectively. The eastern area had the highest correct use at 65.0%, and the central area had the lowest, with 59.7%.

In Mid-Size Cities

- When the data from mid-size cities were combined, 42.4% of these occupants were in the front seats.
- The total use rates for these occupants in mid-size cities increased to 76.8%, and correct use rates increased to 68.8%, again the highest rates in the survey's history.
- Among the mid-size cities, Charlottesville had the highest total and correct use rates (85.9% and 76.3%) and Lynchburg had the lowest (70.5% and 64.6%).

Trends in Restraint Use by Age Group

In order to evaluate the impact of changes made in the mandatory safety restraint use laws, restraint use data were collected for three age groups beginning in 2002: (1) infants under age 4, (2) preschoolers 4 and 5 years old, and (3) older children 6 to 16 years old. Findings for the three age groups can be compared.

In Metropolitan Areas

Between 2002 and 2004, total use rates for all age groups increased. Total use for infants had increased to 98.1%, and the use rate for preschoolers was around 80%. The rate for older children rose to 73.7%. The use rate for preschoolers was about 18 points lower than that for infants; the reasons for this disparity are unknown.

In Mid-Size Cities

- In mid-size cities, infants had the highest use rate (98.1%) followed by preschoolers (84.7%) and then older children (74.6%).

- The total use rate for infants was 14 points higher than the rate for preschoolers. Again, why these disparities exist is unknown.

CONCLUSIONS

- In 2004, practically all of the parents, guardians, family members, and others who were observed transporting children were ensuring that infants under 4 years old were restrained in child seats or booster seats, which are the most cumbersome and difficult restraint systems to use. Unfortunately, this was not the case with preschoolers and older children.
- It has yet to be determined why preschoolers 4 and 5 years old and older children aged 6 to 16 are restrained less often than are infants under 4.
- Based on the observational data, actions toward increasing driver compliance with restraint laws for preschoolers 4 and 5 years old and older children 6 to 16 years old are needed.

RECOMMENDATION

VDH should consider taking actions toward increasing driver compliance with restraint laws for preschoolers 4 and 5 years old and older children 6 to 16 years old.

Such programs could include:

- *Establishing (perhaps in conjunction with the Governor's office) a multidisciplinary task force to study and make recommendations concerning methods to increase safety restraint use among children under 16.*
- *Increasing penalties for non-compliance with current restraint laws:* The current fine for non-compliance is \$25. This fine might not be a sufficient disincentive and perhaps does not send the message that not restraining children is a serious problem with possibly dire consequences. Increasing penalties would require legislative action.
- *Having a portion of the fine set aside for programs regarding children and motor vehicle safety.*
- *Increasing the level of enforcement:* By statute, primary enforcement can be used with regard to child restraint use. This means that officers can pull over a driver solely for failure to have children properly restrained, and in a checkpoint situation, can ticket the driver. Because Virginia already has a primary safety belt law in place for children, consideration could also be given to establishing checkpoints to aid in enforcement.

- *Increasing public awareness of the vulnerability of unrestrained preschoolers and older children:* If the failure to restrain children is due to an incorrect assumption that preschoolers and older children are not as likely as infants to be injured in a crash, educating drivers with regard to the number and likelihood of serious injuries among these age groups might improve use and establish restraint use as a habit among older children prior to their licensing at age 16.
- *Establishing a new offense:* Legislation could be passed establishing a new offense of “child endangerment by motor vehicle” in cases where children are unrestrained in a vehicle in which the driver has committed a moving violation.

BENEFITS ASSESSMENT

The results of the child safety restraint surveys enable VDH to develop and promote legislative, administrative, and public awareness countermeasures that more precisely target obstacles to increased belt and safety seat use by children.

By targeting at-risk preschoolers and older children, VDH might be able to increase restraint use rates, thereby reducing childhood mortality and morbidity by reducing the injury-related consequences of crashes.

ACKNOWLEDGMENTS

The authors express their sincere appreciation to Brian Cox for the many hours he spent traveling around the state to collect the data used in this report and later in assisting in the data entry and analysis. Thanks also go to Ann McDaniel, who prepared the report; Randy Combs, who prepared the figures; and Linda Evans, who edited the report.

APPENDIX

**SAMPLE SIZES FOR PRESCHOOLERS 4 AND 5 YEARS OLD AND OLDER
CHILDREN 6 TO 16 YEARS OLD**

Table A-1

**Sample Sizes for 4 and 5 Year Olds for 1997 through 2004 Surveys
by Area and Seat Location**

Area/Seat Location	2002		2003		2004	
	No.	%	No.	%	No.	%
Total Metropolitan	484		255		315	
Front	95	19.6	37	14.5	40	12.7
Rear	389	80.4	218	85.5	275	87.3
<i>Northern</i>	151		108		127	
Front	26	17.2	11	10.2	21	16.5
Rear	125	82.8	97	89.8	106	83.5
<i>Eastern</i>	213		63		85	
Front	39	18.3	7	11.1	11	12.9
Rear	174	81.7	56	88.9	74	87.1
<i>Central</i>	92		55		65	
Front	22	23.9	10	18.2	5	7.7
Rear	70	76.1	45	81.8	60	92.3
<i>Western</i>	28		29		38	
Front	8	28.6	9	31.0	3	7.9
Rear	20	71.4	20	69.0	35	92.1
Total Mid-Size	81		204		202	
Front	12	14.8	28	13.7	26	12.9
Rear	69	85.2	176	86.3	176	87.1
<i>Danville</i>	21		51		62	
Front	4	19	4	7.8	9	14.5
Rear	17	81	47	92.2	53	85.5
<i>Charlottesville</i>	29		59		53	
Front	3	10.3	7	11.9	1	1.9
Rear	26	89.7	52	88.1	52	98.1
<i>Lynchburg</i>	31		62		51	
Front	5	16.1	10	16.1	9	17.6
Rear	26	83.9	52	83.9	42	82.4
<i>Harrisonburg</i>			32		36	
Front			7	21.9	7	19.4
Rear			25	78.1	29	80.6

Table A-2

**Sample Sizes for 6 to 16 Years Olds for 1997 through 2004 Surveys
by Area and Seat Location**

	2002		2003		2004	
	No.	%	No.	%	No.	%
Total Metropolitan	484		950		984	
Front	95	19.6	455	47.9	501	50.9
Rear	389	80.4	495	52.1	483	49.1
<i>Northern</i>	151		328		314	
Front	26	17.2	131	39.9	137	43.6
Rear	125	82.8	197	60.1	177	56.4
<i>Eastern</i>	213		305		327	
Front	39	18.3	153	50.2	181	55.4
Rear	174	81.7	152	49.8	146	44.6
<i>Central</i>	92		242		240	
Front	22	23.9	125	51.7	122	50.8
Rear	70	76.1	117	48.3	118	49.2
<i>Western</i>	28		75		103	
Front	8	28.6	46	61.3	61	59.2
Rear	20	71.4	29	38.7	42	40.8
Total Mid-Size	81		690		726	
Front	12	14.8	351	50.9	371	51.1
Rear	69	85.2	339	49.1	355	48.9
<i>Danville</i>	21		171		185	
Front	4	19	93	54.4	99	53.5
Rear	17	81	78	45.6	86	46.5
<i>Charlottesville</i>	29		129		145	
Front	3	10.3	58	45.0	74	51.0
Rear	26	89.7	71	55.0	71	49.0
<i>Lynchburg</i>	31		262		254	
Front	5	16.1	128	48.9	126	49.6
Rear	26	83.9	134	51.1	128	50.4
<i>Harrisonburg</i>			128		142	
Front			72	56.3	72	50.7
Rear			56	43.8	70	49.3