Research Report
KTC-88-6

1988 USAGE RATES AND EFFECTIVENESS OF SAFETY BELTS AND CHILD SAFETY SEATS IN KENTUCKY

by

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Commonwealth of Kentucky

October 1988

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
KTC-88-6		

4. Title and Subtitle	5. Report Date
1988 Usage Rates and Effectiveness of Safety Belts and Child Safety Seats in Kentucky	October 1988
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
K. R. Agent	KTC-88-6
9. Performing Organization Name and Address Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0043	10. Work Unit No. (TRAIS) 11. Contract or Grant No. 13. Type of Report and Period Covered Final
12. Sponsoring Agency Name and Address Kentucky State Police Highway Safety Standards Branch Frankfort, KY 40601	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The objective of the survey summarized in this report is to establish 1988 safety belt and child safety seat usage rates in Kentucky to compare to those determined from previous surveys. Also included in this report is an analysis of accident records evaluating the effectiveness of safety belts.

Statewide usage rates in the 19 cities previously surveyed in 1982 through 1986 showed that both driver safety belt usage and child safety seat and safety belt usage increased significantly in 1988 compared to previous years. The statewide usage rate of safety belts by drivers was 20.5 percent in 1988 compared to 13.0 in 1986, 9.2 percent in 1985, 6.9 percent in 1984, 5.8 percent in 1983, and 4.2 percent in 1982. The percentage of children (under four years of age) in either a safety seat or belt was 47.7 percent in 1988 compared to 30.2 percent in 1986, 29.1 percent in 1985, 30.3 percent in 1984, 24.2 percent in 1983, and 15.4 percent in 1982. Usage rates for front-seat passengers in 1988 were higher than those determined in 1986 and 1985 for each age category.

Benefits in the reduction of injuries for occupants involved in police-reported accidents wearing a safety belt or in a safety seat were shown through the analysis of accident records. For example, a 40 percent reduction in fatal or incapacitating injuries was determined for drivers wearing a safety belt compared to those who were not restrained. The documented effectiveness of safety belts as a means of reducing injuries provides support for the recommendation of enactment of a mandatory safety belt law.

17. Key Words	18. Distribution Statement
Safety Belt Child Safety Seat Accident Severity	Unlimited with Kentucky State Police Approval

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	38	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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INTRODUCTION

The use of safety belts and child safety seats is an effective means of reducing injuries to motor-vehicle occupants involved in a traffic accident. Included in this report is an analysis of accident records evaluating the effectiveness of safety belts in reducing injuries in traffic accidents in Kentucky. However, despite the evidence documenting the effectiveness of safety belts and safety seats, usage of these restraint systems has remained low.

In an attempt to increase usage of child safety seats, a law was enacted by the 1982 Kentucky General Assembly requiring use of a "child restraint system" for children 40 inches or less in height. Surveys were conducted before and after the law became effective (1, 2). Those surveys revealed that the statewide usage of child safety seats or safety belts for children under 4 years of age increased from 15.4 percent in 1982 to 24.2 percent in 1983. Those same surveys indicated a statewide driver safety belt usage rate of 5.8 percent in 1983 compared to 4.2 percent in 1982. A survey conducted in 1984 indicated that the statewide usage of child safety seats and safety belts had increased to 30.3 percent while driver safety belt usage had increased to 6.9 percent (3). The 1985 survey revealed that the statewide usage of child safety seats and safety belts had stabilized at 29.1 percent while driver safety belt usage had increased to 9.2 percent (4). The 1986 survey revealed a very similar statewide usage of child safety seats and safety belts of 30.2 percent (compared to 1984 and 1985) while driver safety belt usage increased to 13.0 percent (5). There was no survey conducted in 1987. The increased usage of child safety seats during the period 1982 through 1986 may be attributed to both enactment of the mandatory usage law and to increased public information, which also may have contributed to the increase in driver safety belt usage.

The 1988 Kentucky General Assembly strengthened the child restraint law to include a $50 fine for violation of the law. An objective of the survey summarized in this report is to establish 1988 safety belt and child safety seat usage rates in Kentucky to compare to rates determined from previous surveys. The effect of adding the penalty provision to the child restraint law could be evaluated. Another objective was to evaluate the effectiveness of safety belts in reducing injuries to occupants of motor vehicles involved in a traffic accident.

The National Highway Traffic Safety Administration has been conducting observational surveys to determine usage of safety belts by drivers and child safety seats by infants and toddlers. Data has been taken in 19 cities across the nation. Safety belt usage by drivers in 1988 was found to be approximately 30 percent in cities without mandatory belt laws and 50 percent in cities with belt laws (6). The use of child safety seats in these 19 cities in 1986 was reported as about 70 percent (7). All the cities had laws requiring the use of child safety seats.

PROCEDURE

DATA COLLECTION PLAN

The basic data collection plan used in the previous surveys (1, 2, 3, 4, and 5) was used in the survey conducted as part of this study. The data

collection form, shown in Figure 1, allowed for usage to be recorded for drivers and passengers. In the first surveys, usage was recorded only for children under 4 years old and for drivers. The data collection form was later organized to allow usage to be tabulated for both front- and rear-seat passengers. However, accurate data could not be easily obtained for rear-seat passengers since only a lap belt was available in the large majority of automobiles. Usage could easily be determined for the front-seat passengers since belt usage involves both the lap belt and shoulder harness. This would not include passengers riding in the middle, front-seat position. As shown in Figure 1, passengers were classified by age into four categories. The age categories used in the first surveys for the driver were not used in this survey. The procedure involved collecting data by observation only. This allowed data to be collected by one person.

An explanation of information collected is given in Figure 2. The data sheet was divided into three sections. General information (Section 1) described when and where data were collected. The section pertaining to cars containing children under 4 years of age (Section 2) included basic information concerning type of safety seat used and, when used, the brand and whether it was used properly. Information also was obtained for the driver of any vehicle containing a child under 4 years of age. That information consisted of the driver's age category, sex, and safety belt usage. Section 3 of the data sheet contained safety belt usage information for drivers of other vehicles (those without a child under 4 years of age) and for other front-seat passengers, classified by age.

Child safety seat usage was obtained only for children under 4 years of age. Kentucky's law requires the use of child safety seats for children 40 inches in height or less. Since no interviews were conducted, a judgment concerning age or height had to be made, and the decision was made to use 4 years of age as the cutoff. Using this procedure, it also would be possible to relate survey results to traffic accident data, which report age of occupant. Children were further classified as being less than 1 year old or from 1 through 3 years old. In this report, children less than 1 year of age will be referred to as "infants", and children from 1 through 3 years of age will be termed "toddlers".

This was the sixth year of data collection for the statewide survey cities, and each year's data have been collected at the same sites in most cities. Sites were located either at traffic signals or four-way stops. Some general instructions were followed during data collection. Manuals providing suggestions for data collection procedures were reviewed when developing the data collection plan. A summary of some of the major instructions follows:

1. Data will be collected by observation.
2. Data will be obtained at intersections having either a traffic signal or four-way stop control. Observers will stand on the curb or at the edge of the roadway and observe stopped cars. Data also may be included for cars as they begin moving through a signalized intersection if the car is moving slowly enough to allow accurate observations. Only passenger cars, station wagons, and mini-vans are to be included. Kentucky's law only addresses passenger vehicles, and specifically excludes recreational vehicles and trucks of more than 1 ton.
3. All data should be collected during daylight hours at various times throughout the day.

4. Priority will be given to any car containing a child under 4 years old. Driver and front-seat passenger safety belt information for other cars will be collected when time permits.

5. Observers shall use their best judgment in estimating age. However, they shall not guess on child safety seat usage. When the type of safety seat cannot be determined, it should be noted as unknown.

6. Proper or improper usage, along with the reason for improper usage, should be determined whenever possible, even when the type of child safety seat cannot be determined. (Note: The reasons for improper usage were those that could be identified quickly by observation. Such errors as improper routing of the belt through the seat could not be identified).

DATA COLLECTION LOCATIONS

Data were collected in the 19 cities used to estimate "statewide" usage in the previous surveys. The "statewide" survey cities and the child safety seat survey size in each city are given in Table 1. The sample had to be distributed across the state and be representative of a range of populations to account for social and economic factors. The sample distribution was based on county population categories. From the 1980 census, the number of children under 5 years of age in each county was used to distribute the sample. This was the youngest age category available in census data. The sample size was determined so that the confidence limits for the observed proportion (percent using child safety seats) would be within acceptable bounds for a given probability (8). This resulted in a statewide sample size of 5,000 for child safety seats. The sample of drivers' safety belt usage was much higher as was the sample of front-seat passengers.

IDENTIFICATION OF CHILD SAFETY SEATS

A list of various child safety seats reviewed while preparing for the survey is presented in Table 2. The manufacturer and seat name are shown as well as a description of the type of protection afforded and the age range for which the restraint is to be used. Usage requirements for each safety seat had to be known to determine whether the seat was used properly. For example, when a tether was required but not used, the safety seat would be classified as improperly used. As part of the training process, a notebook containing photographs and literature describing the various seats was prepared. That notebook was used for review before and during the data collection process. The number of models of safety seats has increased dramatically in the past few years which made identification more difficult. However, a relatively few types of safety seats comprised the majority of the safety seats which were observed.

SURVEY DATA ANALYSIS

The child safety seat data were entered into a computer file. That allowed summaries and cross tabulations to be performed rapidly for any of the recorded data. Safety belt usage data for drivers of vehicles not containing children under 4 years of age and for front-seat passengers were summarized manually.

Statewide usage rates for drivers and front-seat passengers wearing safety belts and for children under 4 years of age in either a safety seat or belt were determined. To calculate these statewide rates, the percentages of

the state population in various population categories were used. Data were obtained in cities having a wide range in population; this procedure allowed the effect of population on usage rates to be taken into account.

The 1988 usage rates for each city were tabulated as well as the change in usage compared to that determined in the 1982, 1983, 1984, 1985, and 1986 surveys. The usage determined for the various types of child safety seats was summarized along with the reasons for and extent of improper usage for the various seats. Also, various factors affecting child safety seat and driver safety belt usage were analyzed.

ACCIDENT ANALYSIS

The computer files containing all reported traffic accidents in Kentucky were analyzed to determine the effectiveness of wearing safety belts or riding in a safety seat. The effectiveness of safety belts was related to several factors such as seating position, type of vehicle, and speed limit. The percent reductions in injuries where found, and statistical tests were conducted to determine if the reductions were significant.

RESULTS

STATEWIDE USAGE RATES

Statewide usage rates determined for the 1988 survey for child safety seats and driver safety belt usage are given in Tables 3 and 4, respectively. The rates were calculated using data from the 19 cities previously surveyed in 1982 through 1986. The statewide percentage was derived using the percentages of the state's population in the respective population categories.

Statewide, the 1988 survey indicated that 37.1 percent of children under 4 years of age were in child safety seats. That percentage was 14.4 percent in 1982 before implementation of the child restraint law and increased to 22.7 percent in 1983, 27.3 percent in 1984, 22.7 in 1985, and 23.7 percent in 1986. The percentage of children using a safety belt was 10.6 percent in 1988 compared to 6.5 percent in 1986, 6.4 percent in 1985, 3.0 percent in 1984, 1.5 percent in 1983, and 1.0 percent in 1982. The percentage of children in either a safety seat or belt was 47.7 percent in 1988 compared to 30.2 percent in 1986, 29.1 percent in 1985, 30.3 percent in 1984, 24.2 percent in 1983, and 15.4 percent in 1982. The change in usage over the past several years is shown graphically in Figure 3. These data show that, while the 1982 law resulted in an increase in usage, the usage rate (for children in either a safety seat or belt) stabilized at approximately 30 percent from 1984 through 1986. There was then a substantial increase in usage in 1988 which would be related, in part, to the addition of a penalty provision to the law. There was a statistically significant increase (probability of 0.99) from the 30.2 percent usage in 1986 to the 47.7 percent usage in 1988 (9).

The relationship between child safety seat and belt usage rates and population is shown in Figure 4. The usage rate in the highest population category was more than twice that for the smallest population category. This relationship is also shown in Figure 5 for driver safety belt usage rates, although the increase for the highest population category is not as dramatic.

For a sample size of 5,000, a probability of 0.99, and a proportion of 37.1 percent, the confidence limits of statewide child safety seat usage in 1988 were found to be 35.4 to 38.8 percent (8). Using the same procedure, the confidence limits of the usage of either a safety seat or belt were 46.8 to 48.6 percent.

Statewide, the 1988 survey indicated that 20.5 percent of drivers were using a safety belt. The percentage has increased steadily from 4.2 percent in 1982, 5.8 percent in 1983, 6.9 percent in 1984, 9.2 percent in 1985, and 13.0 percent in 1986. The change in driver safety belt usage is shown graphically in Figure 6. For a sample size of 75,293, a probability of 0.99, and a proportion of 20.5 percent, the confidence limits of statewide driver safety belt usage were 20.1 to 20.9 percent (8). The increase in the usage rate in 1988 compared to 1986 was found to be statistically significant (probability of 0.99) (9).

As noted previously, the 1988 data collection procedure included obtaining safety belt usage data for front-seat passengers (in addition to the children under 4 years of age). These data are summarized in Table 5 for the 19 cities used to determine statewide rates. It may be seen that there is a large reduction in usage for children in the 4 to 5 years of age category (30.2 percent) compared to the under 4 years of age category (47.7 percent) which is affected by the usage law. Usage decreased for the 6 to 12 years category (23.1 percent) compared to the 4 and 5 years of age category. Usage dropped substantially to 14.2 percent for teenage passengers but increased to 17.2 percent for passengers over 19 years of age. The usage rates determined for front-seat passengers in 1988 were higher than those determined in 1986 for each age category.

GENERAL SUMMARY OF SURVEY

Following is a summary of data by city and by type of safety seat as well as an analysis of factors affecting usage.

1988 Usage Rates

Safety belt usage rates of drivers, by city, as determined from the 1988 survey are given in Table 6. The total sample size for the 19 cities was 75,293. As noted in previous surveys, usage was greater in the larger cities. Usage rates varied from 31.2 percent in Lexington to 9.3 percent in Lawrenceburg. Cities having the next highest usage rates were Covington (28.3 percent), Winchester (24.7 percent), and Louisville (24.6 percent). The cities having the next lowest rates were Hazard (9.5 percent), Princeton (11.6 percent), and Glasgow (11.9 percent).

Usages of child safety seats and safety belts (children under 4 years of age), by city, as determined from the 1988 survey are given in Table 7. As with driver safety belt usage rates, those rates were higher in the larger cities. The "percent using any restraint" varied from 78.3 percent in Lexington to 19.4 percent in Hazard. The other cities having usage rates over 50 percent were Louisville (67.6 percent), Newport (59.5 percent), Covington (58.8 percent), Winchester (56.4 percent), and Madisonville (51.7 percent). The only other cities with a usage rate under 30 percent were Carrollton (26.1 percent) and Morehead (25.2 percent).

Another 51 children under 4 years of age (1.0 percent) were in a vehicle having a child safety seat that was not in use. This number is substantially lower than observed in past surveys (3.1 percent in 1986) which may be related to the addition of a penalty to the law. Many children who were not in a safety seat or belt were in especially dangerous positions. About 12 percent (604) of the children were observed to be sitting on adults' laps while approximately 9 percent (462) were observed standing on the seat.

A summary of usage rates (from the 1988 survey) of safety belts by front-seat passengers by city is shown in Table 8. While the sample sizes for some categories in some cities are low, the data generally confirm the statewide statistics given previously. The largest sample sizes were for the "over 19 years of age" category and usage rates for this category varied from a high of 28.7 percent in Lexington to a low of 5.7 percent in Princeton.

Trends in Usage Rates by City

The change in the usage of safety belts by drivers in the 19 statewide survey cities is summarized in Table 9. The usage rate was higher in 1988 than in 1986 in all 19 cities. Usage rates are given for the 7-year period of 1982 through 1988. In 13 of the 19 cities, the rates have increased each year. From 1982 to 1988, the minimum increase was slightly more than doubling in Hazard to an increase of more than 10 times in Madisonville, Winchester, Lawrenceburg, and Maysville.

The change in usage of child safety seats or belts by children under 4 years of age in the survey cities is shown in Table 10. The usage rates in 1988 were higher than those determined in 1986 for all 19 cities. The rate increased each year in only three cities. From 1982 to 1988, the usage rates had more than doubled in all 19 cities. The largest percentage increases over this time period were in Somerset and Newport.

Summary by Type of Safety Seat

Usage of various types of child safety seats is summarized in Table 11. For each safety seat, the number observed as well as the percentage properly used are listed. Data are presented for all children, infants only, and toddlers only. Observers were trained to identify specific seats and their proper usage. The seat used was identified in most instances (about 90 percent).

The Fisher-Price safety seat was the single most frequently noted safety seat of all models observed. The Questor Kantwet One-Step was the second most frequently noted safety seat of all models observed (it was the most frequently observed safety seat in the past few surveys). The Strolee Wee Care had been the most frequently observed in the 1982 and 1983 surveys, and it was the third most frequently observed seat. However, most of the Strolee seats were of the type not requiring a tether while in the earlier surveys the model which required a tether was most common. Questor Kantwet had the highest number of safety seats noted of any single manufacturer. Other commonly observed seats distributed by Questor Kantwet, in addition to the One-Step, included the Bobby-Mac and the Dyn-O-Mite infant seat. A large number of safety seats manufactured by Century and Cosco/Peterson were also observed. The most common infant-only safety seats were the Kolcraft Rock-N-Ride, Questor Kantwet Dyn-O-Mite, and Cosco/Peterson First Ride.

Proper usage was high for most of the various safety seats. Of the most common safety seats, the old Strolee had the lowest proper-usage percentage. This was related to the requirement to use a tether in the toddler position in the older models. The major reasons for improper usage are summarized in Table 12. The major reasons for improper usage included failure to harness the child into the seat and failure to tether the seat as required (this is related to the older Strolee safety seats). An improper usage problem related to infants was facing the infant forward rather than in the proper rear-facing position.

As given in Table 3, the overall percent of child safety seats used properly in 1988 was 91 percent. This is substantially higher than that determined in the first surveys. This increase would be partially related to the decreased use of seats that have low proper-usage percentages. Specifically, more of the newer model Strolee seats, which do not require a tether, are being used. Also, fewer of an older type seat, which were made by more than one manufacturer, in which the child was rarely harnessed are in use. Manufacturers have attempted to make the newer models of safety seats easier to use and to provide clear and concise instructions for proper usage that would decrease improper usage. It also should be noted that improper usage identified in the survey was limited to the types that could be easily noted as a vehicle passed slowly by the observer. Other types of improper usage, such as improper routing of the safety belt, which could not be noted quickly by observation, were not included. Improper usage would be substantially higher if a detailed study of proper usage was conducted. While some of the increase in proper usage may be attributed to the data collection process, the results show that proper usage has increased from that determined from the first surveys.

Factors Affecting Usage

Several other factors, shown in Table 13, were noted as being related to child safety seat usage. Those relationships were similar to those observed in previous surveys. Usage was directly related to age of the child, with the usage rate for infants about 40 percent higher than for toddlers. Usage for children in the rear seat was twice that compared to children in the front seat. Driver age and sex also were somewhat related, with usage slightly higher when a female was driving and for drivers in the middle age category (31 to 51 years of age). The data also showed a reduction in usage when there were more than two small children in a car.

Usage also was much higher for children when the driver was wearing a safety belt. Almost all children (91 percent) riding in a vehicle in which the driver was wearing a safety belt were also either in a safety seat or belt.

ACCIDENT ANALYSIS

The number and percentage of all drivers involved in police-reported accidents sustaining a given injury as a function of safety belt usage is summarized in Table 14 (based on 1983 through 1987 accident data). By comparing the percentages, the percent reduction associated with safety belt usage could be calculated. The largest reduction was for a fatal injury (76 percent reduction) with the reduction decreasing for less severe injuries.

The reductions in the percentage of fatal, incapacitating, and non-incapacitating injuries were found to be statistically significant (probability of 0.99). In severe accidents, use of a safety belt would lessen, but not eliminate, the injury. This resulted in no decrease in the "possible injury" category (there was no statistically significant change in this injury category). There was a 40 percent reduction in a driver sustaining a fatal or severe injury in a traffic accident if a safety belt was worn compared to not wearing a safety belt. This agrees with other research studies which report that lap and shoulder safety belts, when used, reduce the risk of fatal or serious occupant injury by between 40 and 55 percent (6).

The effectiveness of safety belts in reducing driver injuries was related to several variables. In Table 15, the percentage of drivers sustaining either a fatal or severe injury who were wearing or not wearing a safety belt was related to type of vehicle, type of accident, and speed limit. There were reductions in percent fatal or severe injuries for drivers of passenger cars, single-unit trucks, and combination trucks. The reduction was higher for drivers of trucks. Safety belts also reduced the percentage fatally or severely injured in various types of accidents. The types of accidents were chosen to represent the extremes of accidents in terms of severity. The reductions were found in the relatively low severity rear-end accidents as well as the more severe fixed object, head-on, and "overturned" accidents. Safety belts also were determined to be effective in reducing fatal or severe injuries for accidents occurring on either 35-mph local streets or 55-mph high speed roadways.

The number and percentage of children age 3 and under sustaining a given injury as a function of using a safety seat or safety belt is summarized in Table 16. There were substantial reductions, higher for the most severe injury types, associated with both safety seats and safety belts. The reductions were similar for use of either the safety belt or safety seat. The reductions for all injury categories except fatalities were statistically significant (probability of 0.99). The percent reductions were higher than that for drivers (as given in Table 14). There was a 64 percent reduction in the chance of a child less than age 4 sustaining a fatal or severe injury if a safety seat was used compared to not using any restraining device. Also, as shown in Table 17, the reductions in injuries applied to both the rear and front seating positions.

The number and percentage of occupants other than drivers sustaining a given injury as a function of safety belt usage is given in Table 18. Again, there was a large reduction in the percent injured (all reductions were statistically significant with a probability of 0.99). These percent reductions were generally higher than that for drivers. The chance of a vehicle occupant, other than the driver, to sustain a fatal or severe injury was reduced by 45 percent if a safety belt was worn compared to not wearing a safety belt.

The accident severity associated with using a lap belt and/or shoulder harness for occupants other than the driver (by seating position in the front or rear seat) is given in Table 19. Only a lap belt is available in the rear seat in the vast majority of vehicles. The use of a shoulder harness and/or lap belt in the front seat or a lap belt in the rear reduced injuries dramatically (all reductions were statistically significant with a probability of 0.99). Accident severity was less in the rear seat and the percent

reduction in injuries was generally greater in the rear seat than the front seat. The use of a lap belt in the rear seat has been effective since its use was associated with a reduction in fatal or incapacitating injuries of 65 percent. This finding should not be interpreted to suggest that it would not be preferable to have a combination lap belt/shoulder harness in the rear seat.

The potential annual reductions in traffic accident fatalities and accident savings from an increase in driver safety belt usage are presented in Table 20. The reduction in fatalities and associated accident cost savings were calculated using the reduction factors listed in Table 14, accident data for the years of 1983 through 1987, the 20.5 percent usage rate determined from the 1988 observational survey, and accident cost estimates recommended by the Federal Highway Administration (10).

SUMMARY

Statewide usage rates in the 19 cities previously surveyed in 1982, 1983, 1984, 1985, and 1986 showed that both driver safety belt usage and child safety seat and safety belt usage increased substantially in 1988. The statewide usage rate of safety belts by drivers was 20.5 percent in 1988 compared to 13.0 percent in 1986, 9.2 percent in 1985, 6.9 percent in 1984, 5.8 percent in 1983, and 4.2 percent in 1982 (Figure 6). The percentage of children in either a safety seat or belt was 47.7 percent in 1988 compared to 30.2 percent in 1986, 29.1 percent in 1985, 30.3 percent in 1984, 24.2 percent in 1983, and 15.4 percent in 1982 (Figure 3). Usage rates for front-seat passengers in 1988 were higher than that in 1986 for each age category. For example, for front-seat passengers over 19 years of age, usage increased from 11.7 percent in 1986 to 17.2 percent in 1988.

The safety belt usage rate for drivers varied from a low of 9.3 percent in Lawrenceburg to a high of 31.2 percent in Lexington. The percentage of children in either a safety seat or belt varied from a low of 19.4 percent in Hazard to a high of 78.3 percent in Lexington. Usage varied directly with population with higher usage in the largest cities. Current national driver usage rates for cities in states without a belt law has been found to be about 30 percent (6) which is in agreement with that found in the highest populated locations in Kentucky.

The significant benefits, based on the reduction of injuries, for occupants involved in a police-reported accident wearing a safety belt or in a safety seat were shown through the analyses of accident records. For example, one finding was that there was a 40-percent reduction in fatal or incapacitating injuries for drivers wearing a safety belt compared to those who were not. The benefit in terms of the reduction in injuries in wearing a safety belt in either the front or rear seat was documented. The potential savings in fatalities, serious injuries, and accident costs which could be obtained from an increase in the use of safety belts was shown.

RECOMMENDATIONS

While driver safety belt usage has been increasing in the past few years, usage has remained low with a statewide rate of about 20 percent and rates as low as about 10 percent in some small cities. While public information has resulted in increases, a method which has been shown to result in a dramatic

increase in safety belt usage is enactment of a mandatory safety belt law. Surveys have shown usage rates of 30 percent in cities without a belt law compared to 50 percent in cities with a law (6). Additionally, usage is higher in states with primary enforcement policies in which the officer may stop a motorist solely on the basis of a safety belt law violation (11). Belt use as high as 90 percent has been reported in other countries with belt laws and high levels of enforcement (11). It has been estimated that at the current usage level of about 50 percent in states with belt laws, safety belts would have saved 4,700 lives if all states had belt laws in 1987 (6). Similar laws have been enacted in numerous other states and such a law has been proposed in the Kentucky General Assembly but did not pass. An analysis of Kentucky accident records has shown the reduction in accident severity associated with safety belt usage. The potential annual reductions in traffic accident fatalities and accident savings from an increase in driver safety belt usage also has been estimated. For example, a driver usage rate of 50 percent would result in a potential annual reduction of 106 fatalities and an annual accident savings from the reduction in fatalities and serious injuries of about 180 million dollars.

The fact that the use of child safety seats and safety belts for children under the age of four increased substantially in 1988 could be directly related to the addition of a penalty to the law. As shown in Figure 3, the use of child safety seats and safety belts had stabilized at about 30 percent after the original safety seat law was passed but then there was a dramatic increase in usage in 1988 after the addition of the penalty. The usage rate is still not high in some cities which points out the need to enforce the law. It has been shown that usage is directly related to the level of enforcement of any belt law (11). The existing law can be modified and strengthened additionally in accordance with recommendations presented in a previous report (2). An additional modification would include having the law apply to children under the age of 6 and allowing the substitution of safety belts for safety seats for older children. The low usage rate determined for 4 and 5 year olds compared to the under 4 years of age category in this study shows the need for the law to apply to children under 6 years of age. Of course, it would be preferable to enact a mandatory law which would apply to all ages.

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TABLE 1. DISTRIBUTION OF SAMPLE USED TO ESTIMATE "STATEWIDE" USAGE OF CHILD SAFETY SEATS

COUNTY POPULATION CATEGORY (NUMBER OF CHILDREN UNDER 5 YEARS OLD)	PERCENTAGE OF STATEWIDE TOTAL OF CHILDREN UNDER 5 YEARS OLD	SAMPLE SIZE	SURVEY COUNTIES	SURVEY CITIES
10,000 or more	26.6	1,330	Fayette	Lexington
			Jefferson	Louisville
			Kenton	Covington
5,000-9,999	14.0	700	Campbell	Newport
			Christian	Hopkinsville
			Hardin	Elizabethtown
2,500-4,999	23.3	1,165	Franklin	Frankfort
			Henderson	Henderson
			Hopkins	Madisonville
			Perry	Hazard
			Pulaski	Somerset
1,000-2,499	26.0	1,300	Barren	Glasgow
			Clark	Winchester
			Mason	Maysville
			Nelson	Bardstown
			Rowan	Morehead
Under 1,000	10.1	505	Anderson	Lawrenceburg
			Caldwell	Princeton
			Carroll	Carrollton

TABLE 2. LISTING OF AVAILABLE CHILD SAFETY SEATS*

MANUFACTURER	MODEL	DESCRIPTION
Cosco/Peterson	Safe-T-Shield	Convertible; three-point harness for infants; shield only for toddlers
	Safe-T-Seat	Convertible; five-point harness
	Safe and Easy	Convertible; five-point harness
	Safe and Snug	Convertible; combination shield and harness system
	Safe-T-Mate	Convertible; combination shield and harness system
	First Ride	Infants only; Y-harness
	TLC Infant Car Seat	Infants only, Y-harness
	Travel Hi-Lo	Children to 65 lbs; lap and shoulder belt in front seat, belt and tethered body harness in rear
	Deluxe Travel Hi-Lo	Children to 65 lbs; backrest and three-point harness
	Commuter	Convertible; combination shield and harness system
	Explorer	Toddlers and children; swing away shield
	Auto Trac	Convertible; combination shield and harness system
Century	Century 100	Convertible; five-point harness
	Century 200	Convertible; combination shield and harness system
	Century 300	Convertible; five-point harness with armrest
	Century 400XL	Convertible; combination shield and harness (modified inertial reel system)
	Century 1000 STE	Convertible; five-point harness
	Century 2000 STE	Convertible; combination shield and harness system
	Century 3000 STE	Convertible; combination shield and harness system
	Infant Love Seat	Infants only; Y-harness
	570 Infant Car Seat	Y-harness
	Child Love Seat	Toddlers only; five-point harness, tether required
	Safe-T-Rider	Toddlers and children to 10 years; lap and shoulder belt in front seat, lap belt and tethered body harness in rear seat
	Commander	Children to 65 lbs.; full shield
	Trav-l-guard	Convertible; five-point harness with armrest
Strolee	Wee Care 597A	Convertible; five-point harness, tether required
	Wee Care 599	Convertible; five-point harness with armrest; tether required
	Wee Care 618	Convertible; five-point harness with armrest
	Wee Care 612	Convertible; five-point harness
	GT-2000	Convertible; five-point harness,
	Wee Care Booster Seat 602	Children to 70 lbs; auto lap and shoulder belt in front seat, auto lap belt with tethered harness in rear seat
	Quick Click	Children to 70 lbs; full shield

* Convertible restraints can be used by infants and toddlers, infants in a rear-facing position, and toddlers in a forward-facing position. Tethers, where required, are for toddler position only.

TABLE 2. LISTING OF AVAILABLE CHILD SAFETY SEATS* (continued)

MANUFACTURER	MODEL	DESCRIPTION
Evenflo (Questor)	Evenflo Infant Seat	Infants only; Y-harness
	Swinger	Infants only; Y-harness
	Model 410	Convertible; five-point harness
	Dyn-O-Mite	Infants only; Y-harness
	One-Step	Convertible; combination shield and harness system
	Care Seat	Convertible; five-point harness
	Safe Guard	Toddlers only; five-point harness
	Evenflo 7	Convertible; combination shield and harness system
	Britax Handicapped	Toddlers and children; five-point harness
	Bobby Mac Champion	Convertible; five-point harness for infant, add shield for toddler
	Bobby Mac Deluxe II	Convertible; three-point harness for infant, add swing-down shield for toddler
	Bobby Mac Super	Convertible; five-point harness, tether required
	Bobby Mac Wings	Toddler and children; full shield
	Bobby Mac Lite	Toddlers only; requires shield
	Evenflo Booster	Toddlers only; requires shield
International	Astroseat (9300A)	Convertible; five-point harness with armrest
	Astroseat (9100A)	Convertible; five-point harness
	Astroseat 6000	Children to 55 lbs; used with adult three-point belt system or adult lap belt with harness
Kolcraft	Hi-Rider	Convertible; five-point harness, optional shield
	Hi-Rider XL	Convertible; five-point harness with armrest
	Quikstep	Convertible; combination shield and harness system
	Ultra Ride	Convertible; five-point harness
	Tot-Rider	Toddlers and children to 10 yrs; lap and shoulder belt in front seat, lap belt and tethered body harness in rear
	Tot-Rider XL	Toddlers and children to 10 yrs; lap and shoulder belt in front seat, harness system in rear
	Tot-Rider Quikstep	Toddlers and children; full shield
	Redi-Rider	Convertible; combination shield and harness system
	Rock'n Ride	Infants only; Y-harness
	Flip 'n Go	Toddlers and children; full shield
Ford	Tot Guard	Toddlers only; shield only
	Infant Carrier	Infants only; three-point harness
General Motors	Infant Love Seat	Infants only; Y-harness
	Child Love Seat	Toddlers only; five-point harness, tether required

* Convertible restraints can be used by infants and toddlers, infants in a rear-facing position, and toddlers in a forward-facing position. Tethers, where required, are for toddler position only.

TABLE 2. LISTINGS OF AVAILABLE CHILD SAFETY SEATS* (Continued)

MANUFACTURER	MODEL	DESCRIPTION
Welsh	Travel Tot	Convertible five-point harness with shield
Collier-Keyworth	Safe and Sound	Convertible; combination shield and harness system
	Roundtripper	Convertible; combination shield and harness system
	Co-Pilot	Toddlers and children; full protective shield
	Cuddle Shuttle	Infants only; Y-harness
	Voyager	Toddlers and children; full shield
	CK Classic	Convertible; combination shield and harness system
Pride Trimble	Pride Ride (820)	Convertible; five-point harness
	Pride Ride (830)	Convertible; five-point harness with armrest
	Click'N'Go	Toddlers and children; lap and shoulder belt in front seat
Graco	Little Traveler (315)	Convertible; five-point harness with armrest
	Little Traveler (310)	Convertible; five-point harness
	Snug Seat	Infants only
	GT1000	Convertible
Nissan	Infant-Child Safety Seat	Convertible; combination shield and harness (inertial reel) system
E-Z-On Products	E-Z-On Vest	Toddlers and children; auto harness system, tether required
Fisher-Price	Fisher-Price	Convertible; combination shield (body pad) and harness (inertial reel) system
Gerry	Guardian	Convertible; combination shield (body pad) and harness (inertial reel) system
	Voyager	Toddlers and children; full shield
Volvo	Child Cushion	Children; use only with lap/ shoulder belt
Babyhood	Wonda-Chair	Convertible; five-point harness
Ortho-Kinetics	Travel Chair	Two different models to fit infant and toddlers and children; adapted wheelchair requires additional lap belt to secure wheelchair
Tumble Forms	Carrie Car Seat	Handicapped child; harness system requires tether
Z.B. Sales	Bobob 2	Toddlers and children; five-point harness

*Convertible restraints can be used by infants and toddlers, infants in a rear-facing position, and toddlers in a forward-facing position. Tethers, where required, are for toddler position only.

TABLE 3. 1988 "STATEWIDE" CHILD SAFETY SEAT AND SAFETY BELT USAGE RATES

COUNTY POPULATION CATEGORY (NUMBER OF CHILDREN UNDER 4 YEARS OLD)	SAMPLE SIZE	NUMBER USING		PERCENT USING			PERCENT OF CHILD SAFETY SEATS USED PROPERLY
		CHILD SAFETY SEAT	SAFETY BELT	CHILD SAFETY SEAT	SAFETY BELT	ANY RESTRAINT	
10,000 or more	1,330	745	184	56.0	13.8	69.8	93
5,000-9,999	700	244	71	34.9	10.1	45.0	91
2,500-4,999	1,165	359	111	30.8	9.5	40.3	91
1,000-2,499	1,300	401	116	30.8	8.9	39.8	90
Under 1,000	505	106	48	21.0	9.5	30.5	85
All	5,000	1,855	530	37.1	10.6	47.7	91

TABLE 4. 1988 "STATEWIDE" DRIVER SAFETY BELT USAGE RATES

COUNTY POPULATION CATEGORY (NUMBER OF LICENSED DRIVERS)	NUMBER OF COUNTIES IN CATEGORY	PERCENTAGE OF STATEWIDE DRIVING POPULATION	SURVEY COUNTIES	SURVEY CITIES	SAMPLE SIZE	PERCENT DRIVERS USING SAFETY BELTS	PERCENT USAGE FOR CATEGORY
Over 75,000	3	30.0	Jefferson	Louisville	11,173	24.6	27.6
			Fayette	Lexington	8,655	31.2	
			Kenton	Covington	2,787	28.3	
30,001-75,000	9	17.0	Campbell	Newport	2,532	20.1	19.8
			Hardin	Elizabethtown	2,891	19.8	
			Christian	Hopkinsville	2,702	19.5	
20,001-30,000	13	14.6	Hopkins	Madisonville	2,759	20.0	18.4
			Henderson	Henderson	3,482	19.6	
			Franklin	Frankfort	5,271	19.3	
			Pulaski	Somerset	3,051	19.1	
			Barren	Glasgow	2,426	11.9	
10,001-20,000	32	20.0	Clark	Winchester	7,235	24.7	19.9
			Nelson	Bardstown	4,407	19.3	
			Perry	Hazard	2,931	9.5	
			Mason	Maysville	3,840	19.2	
Under 10,001	63	18.4	Rowan	Morehead	3,571	12.0	12.0
			Caldwell	Princeton	1,826	11.6	
			Anderson	Lawrenceburg	2,092	9.3	
			Carroll	Carrollton	1,662	15.9	

TABLE 5. 1988 "STATEWIDE" FRONT SEAT PASSENGER SAFETY BELT USAGE RATES

COUNTY POPULATION CATEGORY (NUMBER OF LICENSED DRIVERS)	PASSENGER AGE CATEGORY							
	4-5 YEARS		6-12 YEARS		13-19 YEARS		OVER 19 YEARS	
	SAMPLE SIZE	PERCENT USAGE FOR CATEGORY	SAMPLE SIZE	PERCENT USAGE FOR CATEGORY	SAMPLE SIZE	PERCENT USAGE FOR CATEGORY	SAMPLE SIZE	PERCENT USAGE FOR CATEGORY
Over 75,000	147	43.5	203	34.0	577	19.2	3,611	25.5
30,001-75,000	102	22.5	169	19.5	521	13.1	1,719	12.4
20,001-30,000	194	32.0	261	23.0	651	13.7	3,644	16.3
10,001-20,000	143	27.3	165	17.6	357	13.4	1,977	16.8
Under 10,000	134	17.2	135	14.8	350	8.3	1,642	9.9
All	720	30.2	933	23.1	2,456	14.2	12,593	17.2

TABLE 6. 1988 USAGE RATES OF SAFETY BELTS BY DRIVERS BY CITY

CITY	POPULATION	SAMPLE SIZE	NUMBER USING SAFETY BELT	PERCENT USING SAFETY BELT
Louisville	298,451	11,173	2,743	24.6
Lexington	204,165	8,655	2,700	31.2
Covington	49,585	2,787	788	28.3
Hopkinsville	27,318	2,702	527	19.5
Frankfort	25,973	5,271	1,016	19.3
Henderson	24,834	3,482	682	19.6
Newport	21,587	2,532	508	20.1
Madisonville	16,979	2,759	553	20.0
Elizabethtown	15,380	2,891	511	19.8
Winchester	15,216	7,235	1,789	24.7
Glasgow	12,958	2,426	289	11.9
Somerset	10,649	3,051	584	19.1
Maysville	7,983	3,840	739	19.2
Morehead	7,789	3,571	427	12.0
Princeton	7,073	1,826	212	11.6
Bardstown	6,155	4,407	850	19.3
Hazard	5,371	2,931	279	9.5
Lawrenceburg	5,167	2,092	195	9.3
Carrollton	3,967	1,662	265	15.9

TABLE 7. 1988 USAGE RATES, BY CITY, FOR CHILD SAFETY SEATS AND SAFETY BELTS (CHILDREN UNDER 4 YEARS OF AGE)

CITY	POPULATION	SAMPLE SIZE	NUMBER USING CHILD SAFETY SEAT	PERCENT USING CHILD SAFETY SEAT	PERCENT OF CHILD SAFETY SEATS USED PROPERLY	NUMBER CHILDREN USING SAFETY BELT	PERCENT CHILDREN USING SAFETY BELT	PERCENT CHILDREN USING ANY RESTRAINT
Louisville	298,451	546	328	60.1	93	41	7.5	67.6
Lexington	204,165	507	292	57.6	94	105	20.7	78.3
Covington	49,585	277	125	45.1	94	38	13.7	58.8
Hopkinsville	27,318	178	41	23.0	85	17	9.6	32.6
Frankfort	25,973	293	95	32.4	96	31	10.6	43.0
Henderson	24,834	200	55	27.5	84	17	8.5	36.0
Newport	21,587	237	117	49.4	94	24	10.1	59.5
Madisonville	16,979	201	83	41.3	90	21	10.4	51.7
Elizabethtown	15,380	285	86	30.2	88	30	10.5	40.7
Winchester	15,216	353	160	45.3	94	39	11.0	56.4
Glasgow	12,958	151	44	29.1	93	11	7.3	36.4
Somerset	10,649	270	96	35.6	91	33	12.2	47.8
Maysville	7,983	280	71	25.4	89	17	6.1	31.4
Morehead	7,789	226	50	22.1	86	7	3.1	25.2
Princeton	7,073	171	45	26.3	78	12	7.0	33.3
Bardstown	6,155	290	76	26.2	81	42	14.5	40.7
Hazard	5,371	201	30	14.9	87	9	4.5	19.4
Lawrenceburg	5,167	158	29	18.4	93	22	13.9	32.3
Carrollton	3,967	176	32	18.2	88	14	8.0	26.1

TABLE 8. 1985 USAGE RATES OF SAFETY BELTS BY FRONT SEAT PASSENGERS BY CITY

CITY	POPULATION	AGE CATEGORY (YEARS) 4-5 SAMPLE SIZE	4-5 NUMBER USING SAFETY BELT	4-5 PERCENT USING SAFETY BELT	6-12 SAMPLE SIZE	6-12 NUMBER USING SAFETY BELT	6-12 PERCENT USING SAFETY BELT	13-19 SAMPLE SIZE	13-19 NUMBER USING SAFETY BELT	13-19 PERCENT USING SAFETY BELT	OVER 19 SAMPLE SIZE	OVER 19 NUMBER USING SAFETY BELT	OVER 19 PERCENT USING SAFETY BELT
Louisville	298,694	66	28	42.4	127	41	32.3	356	67	18.8	1,370	312	22.8
Lexington	204,165	60	27	45.0	45	21	46.7	133	29	21.8	1,851	531	28.7
Covington	49,585	21	9	42.9	31	7	22.6	88	15	17.0	390	76	19.5
Hopkinsville	27,318	42	8	19.0	79	14	17.7	211	33	13.5	422	48	11.4
Frankfort	25,973	46	12	26.1	76	24	31.6	120	17	14.2	1,069	229	21.4
Henderson	24,834	44	17	27.9	42	7	16.7	131	23	17.6	652	115	17.6
Newport	21,587	29	7	24.1	51	11	21.6	168	14	8.3	713	83	11.6
Madisonville	16,979	58	23	39.7	90	21	23.3	183	23	12.6	522	73	14.0
Elizabethtown	15,380	31	8	25.8	39	8	20.5	142	21	14.8	584	83	14.2
Winchester	15,216	58	25	43.1	32	6	18.8	107	16	15.0	871	156	17.9
Glasgow	12,958	11	1	9.1	14	3	21.4	53	4	7.5	523	43	8.2
Somerset	10,649	35	9	25.7	39	5	12.8	168	22	13.1	878	134	15.3
Maysville	7,983	23	4	17.4	35	5	14.3	99	13	13.1	347	61	17.6
Morehead	7,789	29	4	13.8	30	5	16.7	177	17	9.6	715	65	9.1
Princeton	7,073	55	12	21.8	90	13	14.4	153	9	5.9	332	19	5.7
Bardstown	6,155	35	9	25.7	53	13	24.5	86	11	12.8	476	79	16.6
Hazard	5,371	27	1	3.7	40	5	11.1	73	8	11.0	283	37	13.1
Lawrenceburg	5,167	35	6	17.1	12	2	16.7	8	2	25.0	240	23	8.7
Carrollton	3,967	15	1	6.7	3	0	0.0	12	1	8.3	355	55	15.5

TABLE 9. CHANGE IN USAGE OF SAFETY BELTS BY DRIVERS IN STATEWIDE SURVEY CITIES

	PERCENT USING SAFETY BELTS					
CITY	1982	1983	1984	1985	1986	1988
Louisville	6.2	11.9	13.1	13.5	16.0	24.6
Lexington	8.2	10.1	9.8	17.3	24.4	31.2
Covington	8.2	9.3	12.5	16.2	21.7	28.3
Hopkinsville	2.6	3.0	4.5	5.6	10.4	19.5
Frankfort	4.8	7.1	7.4	11.4	14.1	19.3
Henderson	3.1	4.6	7.0	9.0	11.1	19.6
Newport	4.7	6.4	5.4	5.8	8.9	20.1
Madisonville	1.9	2.8	4.8	7.5	11.9	20.0
Elizabethtown	2.6	3.5	5.0	8.3	14.0	19.8
Winchester	2.3	2.9	5.6	8.9	11.7	24.7
Glasgow	2.9	2.8	2.5	4.8	6.0	11.9
Somerset	2.4	3.6	5.6	6.8	9.0	19.1
Maysville	1.5	3.3	5.5	5.7	13.1	19.2
Morehead	2.9	3.2	3.1	5.1	7.2	12.0
Princeton	1.6	1.7	2.4	3.1	6.0	11.6
Bardstown	3.5	4.1	5.9	7.1	13.0	19.3
Hazard	4.4	2.7	4.2	5.9	5.3	9.5
Lawrenceburg	0.8	2.3	3.2	5.6	5.1	9.3
Carrollton	2.6	4.9	5.2	7.3	10.0	15.9

TABLE 10. CHANGE IN USAGE OF SAFETY SEATS OR BELTS BY CHILDREN UNDER 4 YEARS OF AGE IN SURVEY CITIES

	PERCENT USING SAFETY SEATS OR BELTS					
CITY	1982	1983	1984	1985	1986	1988
Louisville	21.6	36.3	49.1	41.6	40.4	67.6
Lexington	32.1	45.8	50.0	44.4	46.2	78.3
Covington	22.4	38.6	49.1	46.9	49.5	58.8
Hopkinsville	11.8	19.1	19.1	20.2	21.3	32.6
Frankfort	15.4	25.9	30.0	27.3	30.0	43.0
Henderson	13.5	18.5	26.0	30.0	31.0	36.0
Newport	11.0	27.4	20.3	21.9	22.4	59.5
Madisonville	12.4	18.4	29.4	35.3	38.3	51.7
Elizabethtown	11.2	26.7	33.7	30.2	31.6	40.7
Winchester	12.5	13.9	33.4	28.6	26.1	56.4
Glasgow	13.9	16.6	20.5	18.5	21.2	36.4
Somerset	7.4	23.3	23.7	21.9	26.3	47.8
Maysville	11.8	18.2	17.1	18.6	24.6	31.4
Morehead	10.2	14.1	12.8	14.6	14.2	25.2
Princeton	9.9	11.7	12.3	16.4	20.5	33.3
Bardstown	19.7	21.0	31.0	30.7	31.0	40.7
Hazard	7.0	9.5	9.0	10.9	13.4	19.4
Lawrenceburg	7.0	6.3	22.2	23.4	19.6	32.3
Carrollton	6.3	10.2	15.9	21.6	18.8	26.1

TABLE 11. USAGE OF VARIOUS TYPES OF CHILD SAFETY SEATS

CHILD SAFETY SEAT	ALL CHILDREN		INFANTS ONLY		TODDLERS ONLY	
	NUMBER OBSERVED	PERCENT PROPERLY USED	NUMBER OBSERVED	PERCENT PROPERLY USED	NUMBER OBSERVED	PERCENT PROPERLY USED
Questor Kantwet	440	92	74	86	366	93
One-Step	321	92	16	56	305	94
Bobby-Mac	59	88	5	80	54	89
Dyn-O-Mite	53	96	53	96	0	DNA*
Model 410	7	100	0	DNA	7	100
Fisher-Price	366	95	52	79	314	98
Century	267	94	15	80	252	98
Strolee Wee Care	244	83	20	80	224	83
Tether	45	27	2	100	43	23
No Tether	199	96	18	78	181	98
Cosco/Peterson	149	89	41	83	108	92
Commuter	40	88	1	0	39	90
Safe-T-Seat	38	87	7	30	31	97
Safe and Snug	35	91	3	100	32	91
First Ride	29	93	29	93	0	DNA
Safe and Easy	5	80	0	DNA	5	80
Unclassified	2	100	1	100	1	100
Kolcraft	96	93	95	93	1	100
Rock N Ride	95	93	95	93	0	DNA
Unclassified	1	100	0	DNA	1	100
Booster Seat	44	98	0	DNA	44	98
Collier Keyworth	29	93	2	50	27	96
Safe and Sound	28	93	1	0	27	96
Cuddle Shuttle	1	100	1	100	0	DNA
International Astroseat	11	82	4	100	7	71
Infant Love Seat	8	88	8	88	0	DNA
Child Love Seat	4	25	0	DNA	4	25
Nissan	4	100	0	DNA	4	100
Gerry Guardian	1	100	0	DNA	1	100

*DNA - Does Not Apply.

TABLE 12. MAJOR REASONS FOR IMPROPER USAGE

REASON	NUMBER WITH GIVEN REASON
Child Not Harnessed as Required	66
Infant Facing Forward	49
Restraint Not Tethered as Required	36

TABLE 13. VARIOUS FACTORS AFFECTING CHILD SAFETY SEAT USAGE

VARIABLE	CATEGORY	SAMPLE SIZE	PERCENT USING SAFETY SEATS OR BELTS
Age (Years)	Less Than 1	560	64
	1-3	4,440	46
Child's Location	Front	2,947	33
	Rear	2,043	69
Driver Sex	M	1,119	43
	F	3,881	49
Driver Age	Y*	2,526	43
	M	2,327	53
	O	147	44
Driver Restrained	Yes	1,854	91
	No	3,146	37
Number of Children Under 4 in Car	1	4,397	47
	2	555	55
	3 or More	48	33

*Y — 16-30 years
M — 31-50 years
O — 51 years or older

TABLE 14. ACCIDENT SEVERITY VERSUS SAFETY BELT USAGE (ALL DRIVERS)*

TYPE OF INJURY	NOT WEARING SAFETY BELT NUMBER	NOT WEARING SAFETY BELT PERCENT	WEARING SAFETY BELT NUMBER	WEARING SAFETY BELT PERCENT	PERCENT REDUCTION
Fatal	1,994	0.23	86	0.05	76**
Incapacitating	22,765	2.59	2,616	1.64	37**
Non-Incapacitating	42,105	4.80	5,932	3.73	22**
Possible	44,305	5.05	8,128	5.11	-1
Fatal or Incapacitating	24,759	2.82	2,702	1.70	40**

* Based on 1983 through 1987 accident data. Total sample size for not wearing a safety belt was 877,833 compared to 159,101 for wearing a safety belt.

** Statistically significant reduction (probability of 0.99).

TABLE 15. ACCIDENT SEVERITY VERSUS SAFETY BELT USAGE BY TYPE OF VEHICLE, SPEED LIMIT, AND TYPE OF ACCIDENT (DRIVERS)*

VARIABLE	CATEGORY	PERCENT SUSTAINING FATAL OR SEVERE INJURY: NOT WEARING SAFETY BELT	PERCENT SUSTAINING FATAL OR SEVERE INJURY: WEARING SAFETY BELT	PERCENT REDUCTION
Type of Vehicle	Passenger Car	2.89	1.75	39
	Single-Unit Truck	1.65	0.61	63
	Combination Truck	2.62	1.22	53
Type of Accident (Non-Intersection)	Rear End	1.37	0.85	38
	Fixed Object	11.64	5.16	56
	Head-On	13.70	8.86	35
	Overturned	16.98	8.26	51
Speed Limit (mph)	35	1.96	1.21	38
	45	2.73	1.63	40
	55	6.98	3.69	47

* Based on 1983 through 1987 accident data.

TABLE 16. ACCIDENT SEVERITY VERSUS SAFETY SEAT AND BELT USAGE (CHILDREN AGE THREE AND UNDER)*

TYPE OF INJURY	NOT USING SAFETY SEAT OR BELT		USING SAFETY SEAT		USING SAFETY BELT		PERCENT REDUCTION	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	SAFETY SEAT	SAFETY BELT
Fatal	38	0.15	6	0.06	3	0.06	60	60
Incapacitating	379	1.53	55	0.54	34	0.63	65**	59**
Non-Incapacitating	1,293	5.22	315	3.09	181	0.34	41**	36**
Possible	1,517	6.12	405	3.98	215	3.97	35**	35**
Fatal or Incapacitating	417	1.68	61	0.60	37	0.68	64**	60**

* Based on 1983 through 1987 accident data. Total sample sizes were 24,769 for not using a safety seat or belt, 10,188 for using a safety seat, and 5,420 for using a safety belt.

** Statistically significant reduction (probability of 0.99).

TABLE 17. ACCIDENT SEVERITY VERSUS SAFETY SEAT AND BELT USAGE BY SEATING POSITION (CHILDREN AGE THREE AND UNDER)*

SEATING POSITION	TYPE OF INJURY	NOT USING SAFETY SEAT OR BELT		USING SAFETY SEAT OR BELT		PERCENT REDUCTION
		NUMBER	PERCENT	NUMBER	PERCENT	
Front	Fatal	32	0.19	3	0.04	79**
	Incapacitating	275	1.64	51	0.70	57**
	Non-Incapacitating	974	5.79	258	3.54	39**
	Possible	1,186	7.05	338	4.63	34**
	Fatal or Incapacitating	307	1.83	54	0.74	60**
Rear	Fatal	6	0.08	6	0.07	12
	Incapacitating	104	1.31	38	0.46	65**
	Non-Incapacitating	319	4.01	238	2.84	29**
	Possible	331	4.16	282	3.38	19**
	Fatal or Incapacitating	110	1.39	44	0.53	62**

* Based on 1983 through 1987 accident data. Total sample sizes were 16,819 and 7,950 for not using a safety seat or belt in the front and rear seats, respectively, and 7,247 and 8,361 for using either a safety seat or belt in the front and rear seats, respectively.

** Statistically significant reduction (probability of 0.99).

TABLE 18. ACCIDENT SEVERITY VERSUS SAFETY BELT OR SEAT USAGE (OCCUPANTS OTHER THAN DRIVERS)*

TYPE OF INJURY	NOT USING LAP BELT OR SHOULDER HARNESS		USING LAP BELT AND/OR SHOULDER HARNESS		PERCENT REDUCTION
	NUMBER	PERCENT	NUMBER	PERCENT	
Fatal	346	0.22	21	0.07	68**
Incapacitating	5,415	3.40	599	1.91	43**
Non-Incapacitating	10,645	6.67	1,378	4.40	34**
Possible	11,607	7.28	2,016	6.43	12**
Fatal or Incapacitating	5,761	3.61	620	1.98	45**

* Based on 1985 and 1987 accident data. Total sample sizes were 159,492 not using a safety belt or seat compared to 31,347 using a safety belt.
** Statistically significant reduction (probability of 0.99).

TABLE 19. ACCIDENT SEVERITY VERSUS SAFETY BELT USAGE (OCCUPANTS OTHER THAN DRIVERS)*

SEATING POSITION	TYPE OF INJURY	NOT USING LAP BELT OR SHOULDER HARNESS		USING LAP BELT AND/OR SHOULDER HARNESS		PERCENT REDUCTION
		NUMBER	PERCENT	NUMBER	PERCENT	
Front	Fatal	268	0.23	16	0.07	70***
	Incapacitating	4,286	3.60	512	2.72	37***
	Non-Incapacitating	8,237	6.92	1,037	2.28	33***
	Possible	9,183	7.71	1,584	7.04	9***
	Fatal or Incapacitating	4,554	3.83	528	2.35	39***
Rear**	Fatal	78	0.19	5	0.06	68***
	Incapacitating	1,129	2.79	87	0.98	65***
	Non-Incapacitating	2,408	5.95	341	3.86	35***
	Possible	2,424	5.99	432	4.88	19***
	Fatal or Incapacitating	1,207	2.98	92	1.04	65***

* Based on 1985 and 1987 accident data. Total sample sizes were 119,038 and 40,454 for not using a safety belt in the front seat and rear seat, respectively and 22,502 and 8,845 for using a safety belt in the front and rear seat, respectively.
** Lap belts only primarily used in rear seat.
*** Statistically significant reduction (probability of 0.99).

TABLE 20. POTENTIAL ANNUAL REDUCTION IN TRAFFIC ACCIDENT FATALITIES AND ACCIDENT SAVINGS FROM INCREASE IN DRIVER SAFETY BELT USAGE*

DRIVER USAGE RATE (PERCENT)	POTENTIAL ANNUAL REDUCTION IN NUMBER OF		ANNUAL ACCIDENT SAVINGS (MILLION$) FROM REDUCTION IN		
	FATALITIES	SERIOUS INJURIES**	FATALITIES	SERIOUS INJURIES	TOTAL
30	34	173	52.5	6.8	59.3
40	70	356	105.0	13.9	118.9
50	106	538	159.0	21.0	180.0
60	142	720	213.0	28.1	241.1
70	178	902	267.0	35.2	302.2
80	214	1,085	321.0	42.3	363.3
90	250	1,267	375.0	49.4	424.4
100	285	1,449	427.5	56.5	484.0

* Based on increase from the 20.5 usage rate found in the 1988 survey, The percent reductions given in Table 14, accident cost estimates recommended by the Federal Highway Administration (7). These costs are $1,500,000 for a fatality and $39,000 for an incapacitating injury.

** Serious injuries were defined as those listed as incapacitating on the accident report.

Figure 3. Usage Rates of Child Safety Seat or Safety Belt for Children Under 4 Years of Age

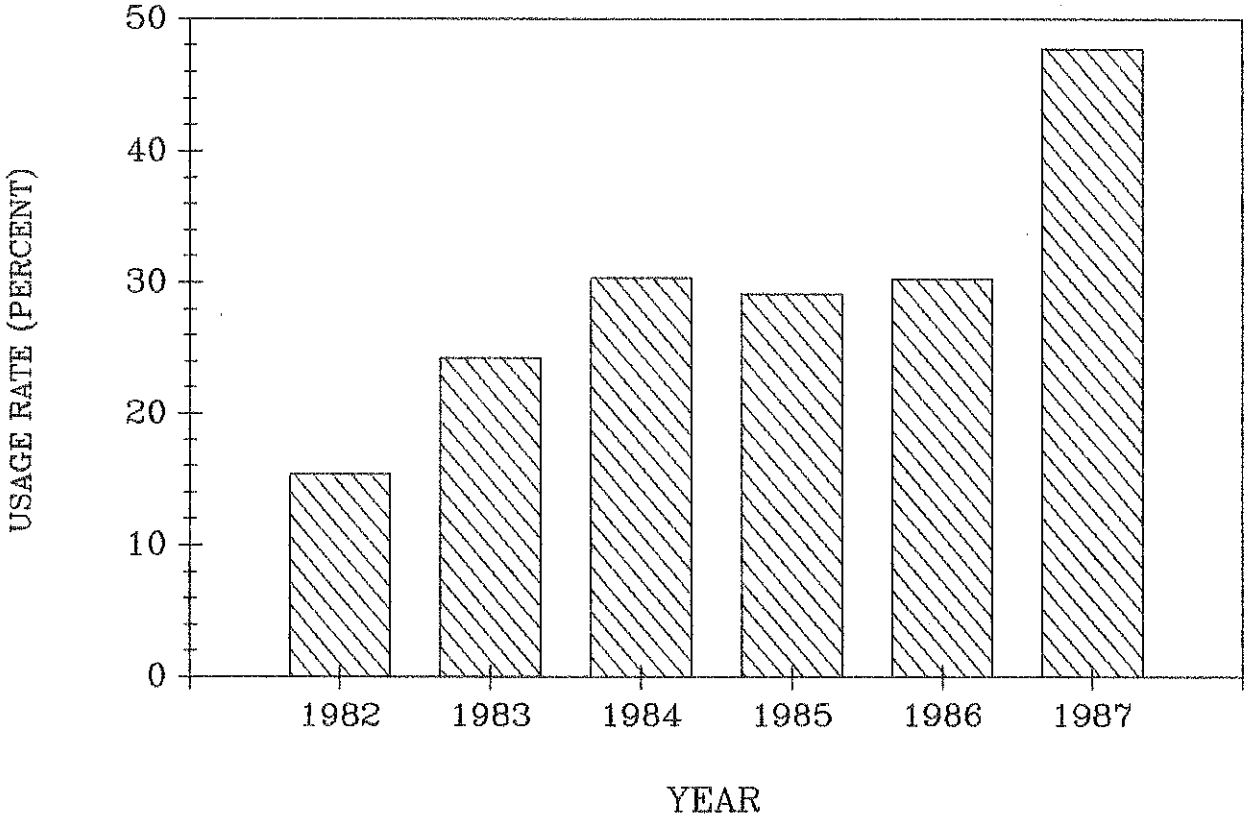

Figure 4. 1988 Child Safety Seat and Belt Usage Rate Versus Population

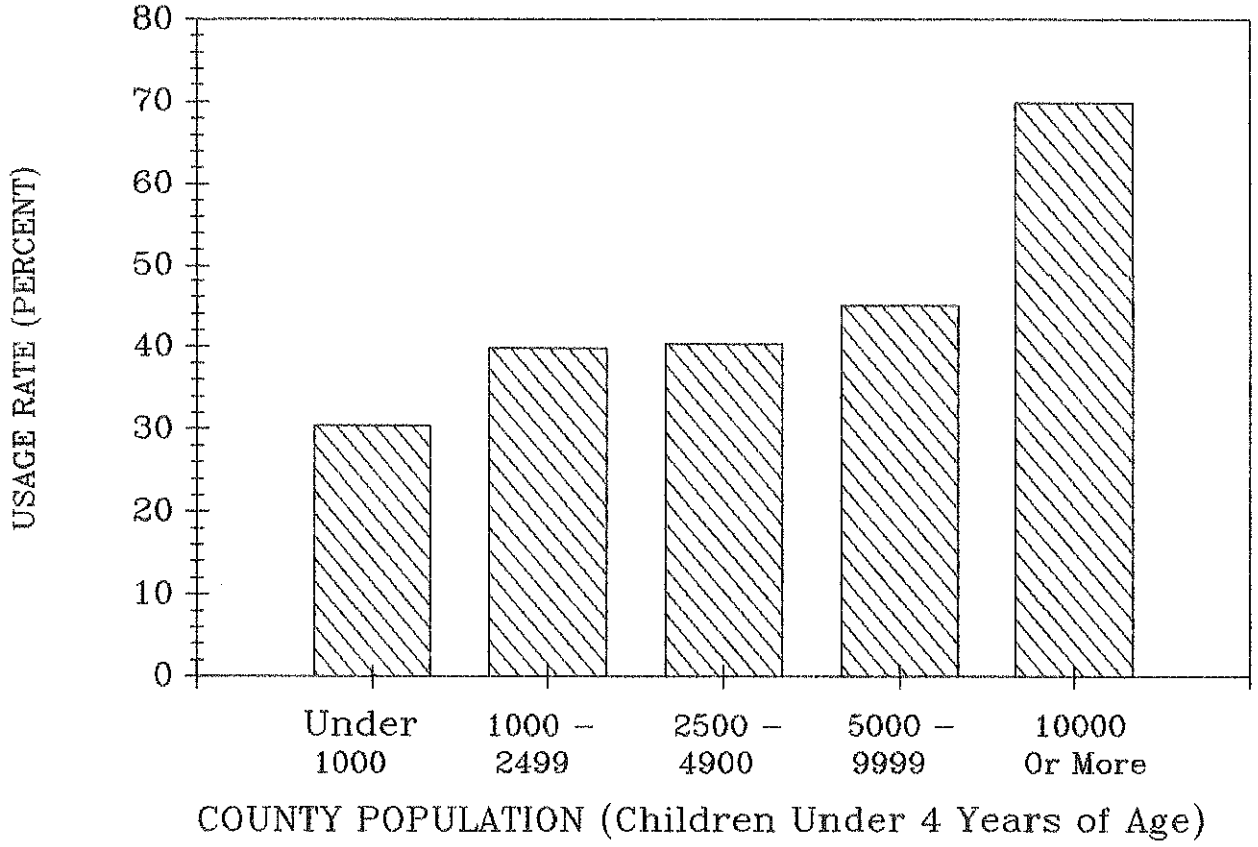

Figure 5. 1988 Driver Usage Rates Versus Population

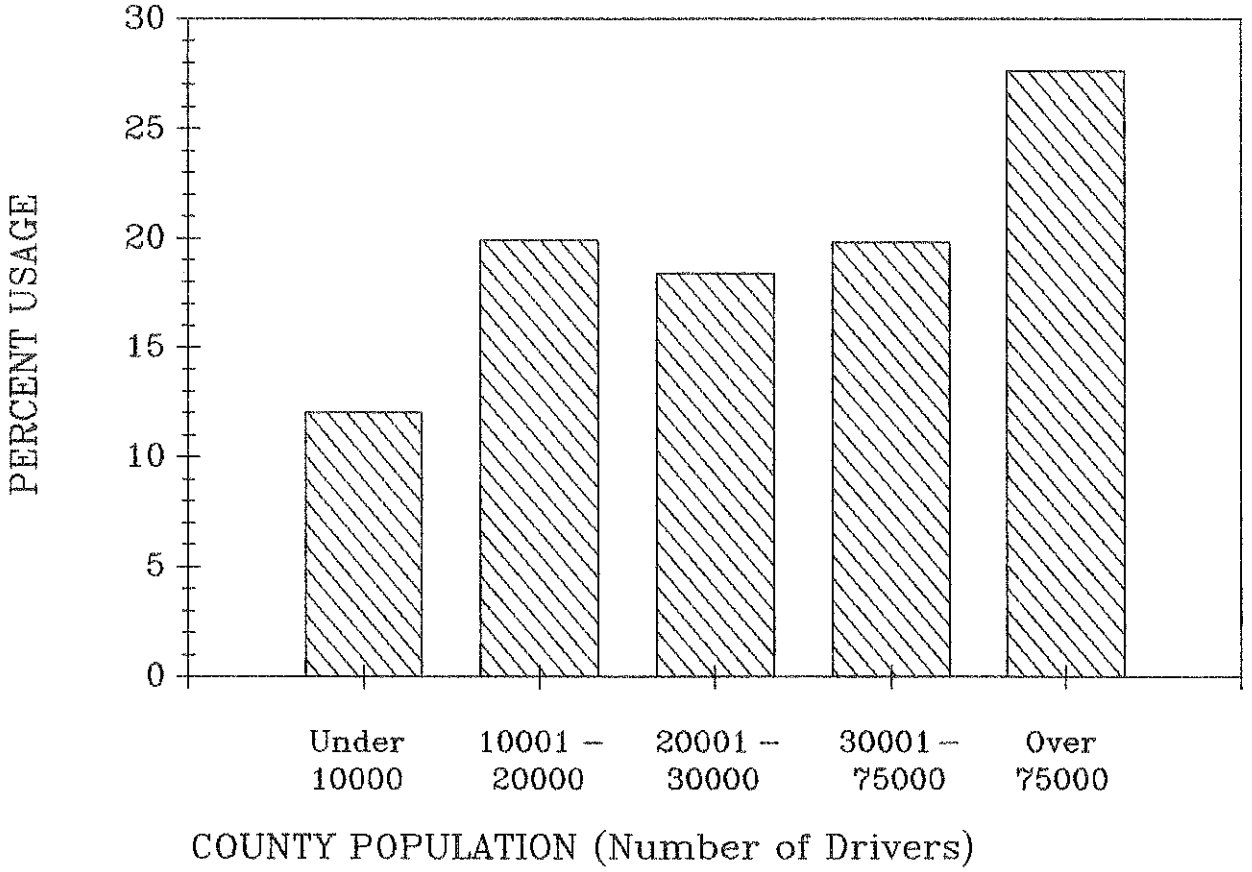

Figure 6. Usage Rate of Drivers