Research Report
KTC-97-17

1997 SAFETY BELT USAGE SURVEY AND EVALUATION OF EFFECTIVENESS IN KENTUCKY

by

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EXECUTIVE SUMMARY

The objective of this study was to establish 1997 safety belt and child safety seat usage rates in Kentucky. The 1997 survey documents the continuing results from enacting a statewide mandatory safety belt law in 1994. Data were collected at 100 sites and combined based on vehicle miles travelled for a given type of highway, rural or urban location, and county population category. Also included in the report is an analysis of accident records evaluating the effectiveness of safety belts.

The data show that the usage rate has stabilized at a level slightly below the high value which occurred in 1994 immediately after enactment of the statewide usage law. The driver usage rate in 1997 was 54 percent, compared to 55 percent in 1996, 54 percent in 1995 and 58 percent in 1994. The current usage is substantially above the 1993 level prior to enactment of the statewide law of 42 percent.

The statewide usage rate for children under the age of four was determined to be 82 percent. This is the highest rate found since the start of the surveys and compares to the previous high of 79 percent in 1996.

Benefits in the reduction of injuries for occupants involved in police-reported accidents who were wearing a safety belt or in a safety seat were shown through the analysis of accident records. For example, there was a 68 percent reduction in the probability of a driver sustaining a fatal or incapacitating injury in a traffic accident when a safety belt was worn compared to not wearing a safety belt.

1.0 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. There have been various types of efforts used to increase safety belt and safety seat usage. Past efforts have included public information campaigns, and both local and statewide legislation. The most recent legislation in this area was statewide legislation requiring the use of safety belts. This law was passed in 1994 with an effective date in July 1994.

The first legislation in this area was a law enacted by the 1982 Kentucky General Assembly, requiring use of a "child restraint system" for children 40 inches or less in height. The 1988 Kentucky General Assembly strengthened the child restraint law to include a $50 fine for violation of the law. Also, prior to the statewide law, local safety belt usage laws were enacted in several jurisdictions in Kentucky. The first such local law, with an effective date of July 1990, was enacted by the Lexington-Fayette Urban County Government. The second local law, with an effective date of July 1991, was enacted by the city of Louisville. Jefferson County later adopted such a law. Other cities and one county which had local safety belt ordinances prior to the statewide legislation included Murray, Bowling Green, Kenton County, Corbin, Bardstown, and Midway. Prior to the statewide law, the combined population of the counties and cities having a local ordinance represented approximately one-third of the statewide population. The statewide law replaced the various local ordinances.

Statewide observational surveys were first conducted in Kentucky in 1982, with data collected in 19 cities across the state. These surveys have been conducted annually since 1982 (with the exception of 1987) to document safety belt and safety seat usage in Kentucky (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14). The number of sites was increased in 1990 in order to obtain a more representative statewide sample (8).

Statewide usage of child safety seats or safety belts for children under 4 years of age increased from about 15 percent in 1982, before enactment of the mandatory child restraint law, to about 30 percent in 1984, and stayed at this level in 1985 and 1986. After a financial penalty was added to the law, this percentage increased to almost 50 percent in 1988 and 1989, 57 percent in 1990 and 1991, and slightly over 60 percent in 1992 and 1993. There has been a continued increasing trend in usage with 72 percent in 1994, 66 percent in 1995, and 79 percent in 1996.

Safety belt usage for the driver increased each survey year from 1982 through 1994. The statewide driver safety belt usage rate was only 4 percent in 1982. It steadily increased to a level of approximately 40 percent in 1991 through 1993. There was a large increase to 58 percent in 1994 after enactment of the statewide law. The first decrease was in 1995 when usage decreased to 54 percent with a slight increase to 55 percent in 1996.

The objective of the survey summarized in this report is to establish statewide 1997 safety belt and child safety seat usage rates in Kentucky. These rates can be compared to those determined from previous surveys. The 1997 survey will determine whether the relatively small decrease in drivers using safety belts in 1995 and 1996, compared to the high rate in 1994 after enactment of the statewide mandatory safety belt law in that year, has continued. Another objective of this study is to analyze accident data to evaluate the effectiveness of safety belts in reducing injuries to occupants of motor vehicles involved in traffic accidents.

2.0 PROCEDURE

2.1 DATA COLLECTION PROCEDURE

The data collection procedure used in the surveys was modified starting with the 1990 survey. The procedure used in the 1990 through 1996 surveys was again used in the 1997 survey. The procedure used for the first several surveys was changed in order to obtain a more representative statewide sample, as well as to use a procedure that would be comparable to surveys taken in other states. The data collection form was changed along with the site selection procedure.

The data collection form used in the survey is shown in Figure 1. Safety belt usage was recorded for drivers and front-seat passengers sitting in the outboard position. These positions are equipped with a combination lap belt/shoulder harness which enables observations to be performed more easily than positions equipped only with a lap belt. The exception was for children under four years of age, for which data were collected for all positions in both the front and the rear seats. Drivers were classified into three age categories and were classified by sex. Passengers were classified into several age categories. For drivers and front-seat passengers (over three years of age), usage was classified as either using a harness or belt or no restraint. For children one to three years of age, the categories included safety seat, booster seat, harness or belt, or no restraint. For children under one year of age, the categories were either safety seat or no restraint.

Three additional types of information were obtained. Starting with the 1993 survey, the use of motorcycle helmets was noted as well as the usage rate for minority drivers. The 1997 survey was the first in which the use of bicycle helmets was noted.

The following list of guidelines for data collection was given to each observer, and each data collector went through a training period.

1. Always include the driver so the number of vehicles included in the sample will be known.

2. Include all vehicles at low-volume locations. When taking data on a multi-lane road, generally include only vehicles in the curb or near lane unless the traffic volume and roadway geometrics allow data to be collected in the next lane.

3. Collect data on only one approach at the intersection.

4. If traffic volume is too heavy to collect data for all vehicles, record data for the next vehicle in view after recording data for the prior vehicle.

5. Obtain a random sample of vehicles independent of whether the occupants are wearing a safety belt. Do not attempt to include all vehicles having an occupant wearing a safety belt at a location where all vehicles cannot be obtained.

6. Attempt to include data for children under four years of age for any vehicle in the sample in which such a child is a passenger.

7. Only include vehicles either stopped or moving so slowly that occupants can be readily observed.

8. Excluding children under four years of age, collect data only for drivers and passengers in the right-front seat (exclude the center front and rear seating positions).

9. Do not include old passenger cars not equipped with a safety belt (typically those vehicles without a head rest).

10. Collect data during daylight hours on weekdays and weekends.

11. Collect four "observer hours" of data at each site. This could be four hours for one approach or two hours for two approaches.

12. Begin and end data collection at a specified time not considering whether the occupants are using a safety belt.

13. Collect data for cars, vans, and light trucks.

14. Do not include a vehicle in the count when use by the driver cannot be determined.

As noted, data were collected for four hours at each location. This could consist of either four hours for one observer or two hours using two observes on different approaches. The decision was made to collect data for an equal time period for each location rather than attempt to collect a given sample size.

Data collection was started in April 1997 and continued through August with the majority of the data obtained in June and July.

2.2 DATA COLLECTION LOCATIONS

Data for the surveys collected from 1982 through 1989 were conducted at 23 sites in 19 cities. The cities were selected so that they would be distributed across the state. These cities were also selected to represent a range of population categories to account for social and economic factors. In order to be able to relate the survey results to data taken in other states and to include all types of roadways, it was necessary to expand the number of sites to include data in rural locations and for interstates. The distribution of the sites was based on vehicle miles travelled statewide for various categories of roads in counties of varying populations. The variables considered were the rural or urban designation of the road, the functional classification of the road, and the county population. This was done so that roads would be stratified to assure a proper representation of urban and rural areas and different road types.

The percentages of vehicle miles travelled on various types of highways in counties within given population ranges are given in Table 1. These percentages represent the proportion of vehicle miles driven on roadways having the given characteristics of the total vehicle miles driven statewide. The data apply to roads for which a traffic volume was available. This is the state-maintained highway system of slightly over 27,000 miles. Local county and city roadways would not be included. The data shown in Table 1 were obtained using 1990 data. There would be little change in the distribution from year to year, so the same percentages have continued to be used. This would allow the same locations to be used each year to assure consistency in the data.

The decision was made to take survey data at 100 sites. The number of sites for any type of highway and county population category was equal to the percentage of vehicle miles travelled for the given type of highway and county population. For example, approximately eight percent of all vehicle miles travelled was on rural arterial highways in counties having a population between 10,000 and 25,000, so eight sites were selected on highways meeting this criterion. A computer file was used to prepare a randomly selected list of sections of roadway for each of the categories given in Table 1. This list was used as a source for selecting sites. Data had been collected at 23 sites since 1982, and it was felt that it would be beneficial to maintain a historical record at these sites; therefore, these sites were maintained. A list of the observation sites is presented in Table 2, and the 23 original sites are identified with an asterisk. Many of the other sites were obtained from the randomly selected list of highway sections.

The sites had to be selected at a location where traffic would stop. A list of all locations having a traffic signal was obtained and used in the selection of sites. Except for some interstate locations, all the sites are at an intersection. Most of the intersections are controlled by a traffic signal. The sites selected to obtain data for interstates were either at an exit ramp or at a rest

area. The rest area sites were the only exceptions to the sites being at an intersection. Data at an exit ramp were taken for traffic exiting the interstate at the intersection between the ramp and intersecting roadway. Another variable which was considered was the geographical location of the sites. Sites were selected to assure that they were distributed across the state. Sites were selected in 62 of the 120 counties. The largest number in any one county was eight in Jefferson County. For each category, the county, location (road and intersecting road), and city (nearest city for rural locations) are given in Table 2.

2.3 SURVEY DATA ANALYSIS

Safety belt usage rates were obtained for the driver and for all front-seat occupants. Rates were also obtained by driver age and sex and by age of the front-seat occupant. Statewide rates were obtained by weighting the usage determined for a given type of highway and county population by the percentage of vehicle miles given in Table 1 and combining the percentages from the various categories. Confidence intervals for the statewide usage rates were calculated.

For children under four years of age, rates were obtained for both front- and rear-seating positions, as well as for combined seating positions. Rates were separated into safety seat, booster seat, and harness or belt.

The 1997 usage rates for the 19 cities previously surveyed were compared to results determined in prior years. The rates for the various types of highway and county population categories were compared.

2.4 ACCIDENT ANALYSIS

The computer files containing all reported accidents in Kentucky (for the years 1992 through 1996) were analyzed to determine the effectiveness of wearing safety belts or riding in a safety seat. The percent reductions in injuries were computed, and statistical tests were conducted to determine if the reductions were significant. This type of analysis was performed for drivers, children age three and under, and front-and rear-seat passengers. The effectiveness of safety belts was related to several factors such as seating position, type of vehicle, and speed limit. The potential annual reductions in the number of traffic accident fatalities and serious injuries, as well as the related dollar savings in accident costs, from an increase in driver safety belt usage were estimated.

3.0 RESULTS

3.1 SURVEY DATA ANALYSIS

Driver usage rates for the various types of highways and county population categories are summarized in Table 3. The overall statewide rate in 1997, using the data collected at 100 sites

and the weighting procedure described, was 54 percent. The sample size was 97,057 drivers. The confidence limits for a probability of 0.99 would be plus or minus 0.5 percent (15). For a given type of highway (excluding rural interstates), the usage rate was higher for counties having larger populations. In several instances, there were large fluctuations in usage rates at survey sites within the same location and population category.

While the data collection procedure changed in 1990, the usage rate may still be compared to the statewide rates from past years. The previous studies showed that statewide driver usage rates had steadily increased from 4.2 percent in 1982 to 42 percent in 1993. However, the rate of the increase had decreased. Only a three percentage point increase occurred in the two-year period from 1991 to 1993. The 58 percent usage in the 1994 survey showed that a dramatic increase occurred between the 1993 and 1994 data collection periods. This increase was directly related to the enactment of a statewide safety belt law. The 1995 survey showed that driver usage (54 percent) remained substantially higher than before enactment of the law, but there was a slight decrease in usage from the rate immediately after enactment of the law. The 1996 survey showed that driver usage (55 percent) increased slightly from 1995 but was below the 1994 level. The 1997 survey found that driver usage (54 percent) remained very similar to that in 1995 and 1996. Due to very large sample size, the slight decrease in the driver usage rate in 1997 compared to 1996 was determined to be statistically significant (probability of 0.99) (16).

Usage rates for front-seat passengers for the various types of highways and county population categories are summarized in Tables 4 through 7 for the different age categories. Usage for children in the four to five years of age category was 65 percent plus or minus about 3 percent. This compares to 56 percent for the 1996 survey, and this increase was statistically significant. For children in the 6 to 12 years of age category, the usage rate was 61 percent plus or minus about 3 percent. This compares to 56 percent in 1996, and this increase was not statistically significant. For the 13 to 19 years of age category, the usage rate was 47 percent plus or minus about 2 percent. This was an increase from 45 percent in 1996, and this increase was not statistically significant. For the category of over 19 years of age, the usage rate was 56 percent plus or minus about 1 percent. This was an increase from 53 percent in 1996 with this increase statistically significant.

Usage rates for children one through three years of age are given in Table 8, while rates for children under one year of age are given in Table 9. These rates are for children in both the front and the rear seats. The usage rate for children under one year of age (93 percent with a confidence limit of about 3 percent) was higher than that for children one to three years of age (80 percent with a confidence limit of about 2 percent). The usage rate for the combination of these categories, or children under four years of age, was 82 percent with confidence limits for a probability of 0.99 percent of about 2 percent.

The sample size for children under four years of age was 3,211. This age category corresponds to the children for which the mandatory child restraint law would apply. The 1997 usage rate of 82 percent compares to 79 percent in 1996, 66 percent in 1995, 72 percent in 1994,

61 percent in 1993, 62 percent in 1992, and 57 percent in 1990 and 1991. This percentage was about 15 percent in 1982 before enactment of the child restraint law, increased to approximately 30 percent after enactment of the law having no penalty, and increased again to almost 50 percent in 1988 after the addition of a monetary penalty to the child restraint law.

The usage rate for children under four years of age was higher in the rear seat compared to the front seat. For children one to three years of age, the usage rate was 84 percent for the rear seat compared to 67 percent for the front seat. For children under one year old, the usage rate was 96 percent for the rear seat compared to 76 percent for the front seat. There was a higher percentage of children observed in the rear seat for both age groups (about 75 percent). This is an increase from the 57 percent observed in the rear seat in 1996.

Safety belt usage rates for drivers and front-seat passengers, by type of highway, are presented in Table 10. The highest usage rates were on interstates (both rural and urban). This would be related in part to the longer trip lengths and higher speeds on interstates, and the tendency of drivers to use safety belts more often for this type of travel. The lowest usage rates were on rural, non-interstate highways with the lowest rate on rural, local highways. There was substantial variation between highway types. For drivers, the percentage using a safety belt varied from 41 percent on rural, local highways to 70 percent on rural interstates. For front-seat passengers, the percentage for those using a safety belt varied from 44 percent on rural, local highways to 69 percent on rural interstates. For children under four years of age, there was less variation with the percentage using a safety seat or safety belt ranging from 73 percent on rural arterials to 94 percent on urban interstates.

There was a variation in usage by the age and sex of the driver (Table 11). Females had a substantially higher usage rate than males. The category of over 50 years of age had a slightly higher usage rate than either the 31 to 50 or 16 to 30 years of age categories.

The highest usage rate for front-seat passengers was for the under four years of age category (Table 12). This would be expected, since the mandatory child restraint law has applied to this age category for several years. Teenagers had the lowest usage rate.

The change in usage of safety belts by drivers in the 19 cities in which data have been collected since 1982 is presented in Table 13. The usage rates in 1997 were very similar to that in 1996. The rate increased in 7 cities, decreased in 11 cities, and was the same in the other city. The largest change was 7 percent. Considering all 19 cities, the usage rate ranged from 65 percent in Lexington down to 39 percent in Glasgow. Using the procedure followed in the original surveys where data were taken only at sites in these 19 cities results in a statewide usage rate of 54 percent. This rate is the same as that determined using the revised procedure in which data are collected at 100 sites.

The change which occurred in the first four years after the law can be seen by comparing the usage rates for drivers at the 100 data collection sites. In 1994, the rates increased at 99 of

the locations compared to the 1993 data. In 1995, compared to 1994, the rates decreased at 75 sites, increased at 22 sites and remained the same at three sites. In 1996, compared to 1995, the rates increased at 51 sites, decreased at 44 sites and remained the same at five sites. In 1997, compared to 1996, the rates increased at 36 sites, decreased at 54 sites, and remained the same at 10 sites. The largest increase was 15 percent, while the largest decrease was 8 percent. Usage rates for drivers ranged from 26 percent in Owingsville to 77 percent at three sites on Interstate 75 (in Boone, Rockcastle, and Scott Counties). There were 10 sites which had a usage rate of 70 percent or above, of which 9 were interstate locations (with the remaining site in Lexington). There were only 2 sites with a usage rate under 30 percent, and 6 sites with a usage rate under 35 percent. All of these low rates occurred in small towns.

The change in usage of safety seats or belts by children under four years of age in these 19 cities is presented in Table 14. The usage rate was higher in 1997 than in 1996 in 12 of the 19 cities, while it decreased in 5 cities, and was the same in the remaining 2 cities. The usage rates ranged from 92 percent in Covington down to 66 percent in Maysville and Hazard. Using the procedure followed in the original surveys in which data were taken only at sites in these 19 cities results in a statewide usage rate of 83 percent which is almost identical to the rate found using the revised procedure in which data are collected at 100 sites.

A summary of the data collected is given in the Appendix. For each of the 100 data sites, the usage rate and sample size are given for drivers, front-seat passengers (by age category for over three years of age), and children in the one to three years of age and under one year old age categories (both front and rear seat).

Obvious improper usage of safety seats had been estimated in the first several surveys. However, improper usage could only be determined when there was a very obvious problem. Since the improper usage percentages were very low compared to studies dealing specifically with this subject, improper usage data were not summarized for this survey.

Helmet use by motorcyclists was noted during the survey. Kentucky has a statewide law requiring the use of a helmet by a motorcyclist. The results confirm the expected high usage. Only 8 of the 269 observed motorcyclists were not wearing a helmet, giving a usage rate of 97 percent.

Usage for minority drivers was obtained with a sample size of almost 3,000 drivers. The same procedure used for all drivers was utilized to obtain a statewide usage rate. The statewide usage rate for minority drivers was determined to be slightly under 50 percent compared to 54 percent for all drivers. This shows there was a small difference in usage rates for minority drivers.

Bicycle helmet use was observed for 144 bicyclists. Only 11 of these bicyclists were wearing a helmet. This low rate (8 percent) shows the need for additional public information about this subject.

3.2 ACCIDENT ANALYSIS

The number and percentage of all drivers involved in police-reported accidents sustaining a given injury as a function of whether a safety belt was used are summarized in Table 15 (based on 1992 through 1996 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 (90 percent reduction) with the reduction decreasing for less severe injuries. For comparison, the reduction was 22 percent for the "possible injury" category. The reductions in the percentage for each of the types of injuries were determined to be statistically significant (probability of 0.99) (16). In severe accidents, use of a safety belt would lessen, but not eliminate, the injury. This resulted in the smaller reductions in the less severe injury classifications. There was a 68 percent reduction in a driver sustaining a fatal or severe injury in a traffic accident when a safety belt was worn compared to not wearing a safety belt. The data are in general agreement, although the percent reductions are somewhat higher, with other research studies which report that lap and shoulder safety belts, when used, reduce the risk of fatal or serious occupant injuries by between 40 and 55 percent (17).

The effectiveness of safety belts in reducing driver injuries was related to several variables. In Table 16, 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 the percentage of fatal or severe injuries for drivers of passenger cars, single-unit trucks, and combination trucks. The reduction was slightly higher for drivers of trucks. The severity of injuries to drivers of passenger cars was higher than for drivers of trucks. Safety belts also reduced the percentage for 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. Reductions were noted for 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 three and under sustaining a given injury as a function of whether a safety seat or safety belt was used are summarized in Table 17. There were substantial reductions, higher for the most severe injury types, associated with using either a safety seat or safety belt. The reductions were fairly similar for use of either the safety seat or safety belt. The reductions in injuries were statistically significant (probability of 0.99). Of 48 fatalities, 18 involved children not using a safety seat or safety belt. The percent reductions were slightly higher than that for drivers (as given in Table 15). There was a 79 percent reduction in the chance of a child less than age four, involved in a traffic accident, sustaining a fatal or severe injury when a safety seat was used as compared to not using any restraining device. Also, as shown in Table 18, the reductions in injuries applied to both the rear-and front-seating positions. The data in Table 18 show that accident severity was less in the rear than in the front seat.

The number and percentage of occupants other than drivers sustaining a given injury as a function of whether a safety belt was used are listed in Table 19. As with drivers, there was a large reduction in the percent injured (all reductions were statistically significant with a probability of 0.99). Overall, these percent reductions were very similar to those for drivers. The chance of a vehicle occupant, other than the driver, sustaining a fatal or severe injury in a traffic accident was reduced by 67 percent if a safety belt was worn compared to not wearing a safety belt.

The accident severities 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) are listed in Table 20. Only a lap belt was available in the rear seat in the majority of vehicles involved in accidents in the time period studied. The use of a shoulder harness and/or lap belt in the front seat, or primarily 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 primarily a lap belt in the rear seat has been effective, with a reduction in fatal or incapacitating injuries of 72 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 21. The reduction in fatalities and associated accident cost savings were calculated using the reduction factors listed in Table 15, accident data for the years of 1992 through 1996, the 55 percent usage rate determined from the 1996 observational survey, and accident cost estimates recommended by the Federal Highway Administration (18).

4.0 SUMMARY

Observations were taken at 100 sites across Kentucky to obtain safety belt usage rates. A sample of almost 100,000 drivers was obtained.

A statewide safety belt law was passed in Kentucky in 1994. The law applies to all vehicle occupants. Prior to the statewide law, there were local ordinances passed in several cities and counties which covered approximately one-third of the statewide population. The data collected in 1994, after the effective date of the statewide law, showed that enactment of the statewide law had a dramatic effect on usage rates. The usage rate for drivers increased from 42 percent in 1993 to 58 percent in 1994. It then decreased slightly to 54 percent in 1995 and rose slightly to 55 percent in 1996. The survey data collected in 1997 show that the rate decreased slightly to 54 percent. A summary of driver usage rates from 1982 through 1997 is given in Table 22. With the exception of rural interstates, the rate was generally higher in urban compared to rural areas. The lowest rates were on local roadways in rural counties.

The statewide usage rates for front-seat passengers were also obtained. Considering all passengers, the usage rate was 53 percent. Usage varied with age, with the highest usage for the under four years of age category and the lowest usage for the teenage category.

Kentucky had a statewide law requiring children under 40 inches in height to be placed in a child restraint prior to the law applying to all occupants. The statewide usage rate for children under the age of four (including both the front and rear seat) was determined to be 82 percent. This represents an increase from the 79 percent usage determined in the 1996 survey.

The usage rate determined for minority drivers was slightly less than that for all drivers. The very high compliance of motorcyclists with the requirement to wear a helmet was confirmed (97 percent helmet usage). The percentage of bicyclists observed wearing a safety helmet was very low (8 percent).

The significant benefits, based upon 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 analysis of accident records. For example, one finding was that there was a 68 percent reduction in fatal or incapacitating injuries for drivers involved in a traffic accident wearing a safety belt compared to those who were not. The benefit, in terms of the reduction in injuries, from 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. For example, an increase in the driver usage rate up to 70 percent usage would result in a potential annual reduction of 159 fatalities and an annual accident savings from the reduction in fatalities and serious injuries of about 280 million dollars.

5.0 RECOMMENDATIONS

The data show that the increased level of safety belt usage which occurred after enactment of the statewide safety belt law in 1994 has remained. However, the usage has not continued to increase and is actually slightly below the 1994 level. While the usage rate in 1997 is still substantially above the level prior to the statewide law, efforts must be made to increase usage. The efforts should include both education and enforcement. Public information and education concerning the law and the reasons to wear safety belts should continue. Also, enforcement of the law along with public information about this enforcement and resulting citations should be increased. The survey data can be used to identify areas in need of additional enforcement and education.

To aid in enforcement of the law, consideration should be given to modifying the current law to allow primary, rather than secondary, enforcement.

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Figure 1. Data Collection Form

SAFETY BELT DATA COLLECTION FORM

Date: _____ Starting Time: _____ Ending Time: _____ Int #: _____

Location: _____ Sheet No: _____

Observer: _____ Comment: _____

DRIVER USAGE

Age and Sex	Harness or Belt	None
16-30 M		
31-50 M		
> 50 M		
16-30 F		
31-50 F		
> 50 F		
Minority		

FRONT-SEAT OCCUPANT USAGE (OVER 3 YEARS OF AGE)

Age	Harness or Belt	None
4-5		
6-12		
13-19		
Over 19		

USAGE FOR CHILDREN 1-3 YEARS OF AGE

	Safety Seat	Booster Seat	Harness or Belt	None
Front				
Rear				

USAGE FOR INFANTS (UNDER 1 YEAR OF AGE)

	Safety Seat	None
Front		
Rear		

Motorcycle Helmet: Y- N-

Bicycle Helmet: Y- N-

TABLE 1. DISTRIBUTION OF VEHICLE MILES TRAVELED BY TYPE OF HIGHWAY AND COUNTY POPULATION

TYPE OF HIGHWAY	COUNTY POPULATION	PERCENTAGE OF ALL VEHICLE MILES
Rural Interstate	Over 100,000	1.04
	50,001-100,000	2.78
	25,001-50,000	4.96
	10,000-25,000	5.19
	Under 10,000	1.32
Rural Arterial	Over 50,000	3.14
	25,001-50,000	7.36
	10,000-25,000	8.12
	Under 10,000	1.93
Rural Collector	Over 100,000	0.65
	50,001-100,000	3.19
	25,001-50,000	7.70
	10,000-25,000	9.72
	Under 10,000	2.28
Rural Local	Over 50,000	0.74
	25,000-50,000	1.74
	Under 25,000	3.74
Urban Interstate	Over 100,000	8.32
	50,000-100,000	1.49
	Under 50,000	1.06
Urban Arterial	Over 100,000	10.23
	25,000-100,000	9.52
	Under 25,000	1.79
Urban Collector or Local	All	1.99

TABLE 2. STATEWIDE SURVEY LOCATIONS

TYPE LOCATION	COUNTY POPULATION	SURVEY SITE
Rural Interstate	Over 100,000	Fayette, I 64 at KY 859, Lexington
	50,001-100,000	Boyd, I 64 at US 23, Catlettsburg Christian, I 24 at US 41A, Hopkinsville Hardin, I 65 at rest area, Sonora
	25,001-50,000	Barren, I 65 at KY 70, Cave City Boone, I 75 at rest area, Florence Clark, I 64 at KY 627, Winchester Franklin, I 64 at US 60, Frankfort Laurel, I 75 at KY 80, London
	10,000-25,000	Henry, I 71 at KY 153, Sligo Rockcastle, I 75 at US 25, Mt. Vernon Scott, I 75 at rest area, Georgetown Shelby, I 64 at KY 53, Shelbyville Woodford, I 64 at KY 341, Midway
	Under 10,000	Trigg, I 24 at US 68, Cadiz
Rural Arterial	Over 50,000	Pike, US 460 at KY 122, Shelbiana Daviess, US 60 at KY 144, Owensboro Hardin, US31 W at BR US31 W, West Point
	25,001-50,000	Perry, KY 15X at KY 476, Hazard* Knox, US 25E at KY 225, Barbourville Harlan, US 119 at KY 179, Cumberland Floyd, KY 80 at US 23, Allen Bullitt, US 31E at KY 44, Mt. Washington Carter, KY 1 at I 64, Grayson Laurel, US 25 at KY 80, London
	10,000-25,000	Mason, US 62 at KY 11, Maysville* Clay, US 421 at KY 80, Manchester Bourbon, US 68 at 5th St., Millersburg Casey, US 127 at KY 70, Liberty Meade, US 31W at KY 1638, Muldraugh Lincoln, US 127 at KY 78, Hustonville Russell, US 127 at KY 80, Russell Springs Washington, US 150 at KY 55, Springfield
	Under 10,000	Cumberland, KY 90 at KY 61, Burkesville Ballard, US 60 at KY 358, LaCenter

TABLE 2. STATEWIDE SURVEY LOCATIONS (continued)

TYPE LOCATION	COUNTY POPULATION	SURVEY SITE
Rural Collector	Over 100,000	Fayette, KY 418 at I 75, Lexington
	50,001-100,000	Christian, US 41 at KY 1682, Hopkinsville McCracken, US 62 at US 68, Reidland Madison, KY 52 at KY 876, Richmond
	25,001-50,000	Barren, KY 255 at US 31W, Park City Nelson, US 62 at KY 48, Bloomfield Boone, KY 18 at KY 237, Burlington Oldham, KY 146 at KY 393, Buckner Knox, KY 11 at US 25E, Barbourville Henderson, KY 145 at US 60, Corydon Boyle, US 68 at US 150, Perryville Greenup, KY 1 at US 23, Greenup
	10,000-25,000	Caldwell, KY 139 at Jefferson, Princeton* Grayson, US 62 at KY 259, Leitchfield Allen, US 231 at US 31E, Scottsville Bath, US 60 at KY 36, Owingsville Larue, KY 84 at KY 61, Hodgenville Scott, US 62 at I 75, Georgetown Anderson,US127 at US127B, Lawrenceburg Breathitt, KY 30 at KY 15, Jackson Webster, US 41 at KY 56, Sebree Garrard, KY 39 at US 27, Lancaster
	Under 10,000	Carroll, US 42 at 6th Street, Carrollton* Elliott, KY 32 at KY 7, Sandy Hook
Rural Local	Over 50,000	McCracken, KY 1286 at US 62, Paducah
	25,000-50,000	Harlan, KY 840 at US 119, Loyall Greenup, KY 7 at US 23, South Shore
	Under 25,000	Lewis, KY 10 at KY 57, Tollesboro Simpson, KY 73 at KY 100, Franklin Adair, KY 2290 at KY 55, Columbia Taylor, KY 208 at US 68, Campbellsville
Urban Interstate	Over 100,000	Kenton, I 275 at KY 17, Covington Kenton, I 75 at KY 371, Cresent Springs Fayette, I 75 at US 68, Lexington Jefferson, I 64 at KY 1747, Louisville

TABLE 2. STATEWIDE SURVEY LOCATIONS (continued)

TYPE LOCATION	COUNTY POPULATION	SURVEY SITE
Urban Interstate	Over 100,000	Jefferson, I 65 at KY 1631, Louisville Jefferson, I 264 at US 31E, Louisville Jefferson, I 264 at US 42, Louisville Jefferson, I 264 at US 60, Louisville
	50,000-100,000	Warren, I 65 at US 231, Bowling Green
	Under 50,000	Boone, I 71 at KY 14, Verona
Urban Arterial	Over 100,000	Jefferson, US 31W at Gagel, Louisville* Jefferson, KY 1447 at Hubbards, Louisville* Jefferson, KY1703-Trevillian Way,Louisville* Fayette, US 27 at KY 1683, Lexington* Fayette, Reynolds - Lansdowne, Lexington* Fayette, KY 4 at KY 353, Lexington* Kenton, US 25 at KY 236, Covington Kenton, KY 8 at KY 17, Covington Kenton, KY 16 at KY 177, Covington Fayette, US 25 at Fontaine, Lexington
	25,000-100,000	Campbell, US 27 at Carothers, Newport* Christian, US 41 at Ninth, Hopkinsville* Hopkins, US 41A at KY 70, Madisonville* Pulaski, US 27 at KY 80, Somerset* Franklin, US 60 at Sunset, Frankfort* Henderson, US 41A at First, Henderson* Nelson, US 31E at Beall, Bardstown* Barren, US 68 at Race, Glasgow* Clark, US 60 at KY 1958, Winchester* Warren, US31W at US231, Bowling Green
	Under 25,000	Anderson, US 62 at US 127, Lawrenceburg* Rowan, US 60 at KY 32, Morehead*
Urban Collector or Local	All	Hardin, Poplar at Sycamore, Elizabethtown* Kenton, KY 1072 at Highland, Covington*

* Original data collection site.

TABLE 3. DRIVER USAGE RATES

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	66	301
	50,001-100,000	66	1,377
	25,001-50,000	72	2,540
	10,000-25,000	69	1,761
	Under 10,000	71	381
Rural Arterial	Over 50,000	57	3,725
	25,001-50,000	53	8,023
	10,000-25,000	46	8,132
	Under 10,000	39	1,867
Rural Collector	Over 100,000	63	1,070
	50,001-100,000	55	3,382
	25,001-50,000	48	5,441
	10,000-25,000	45	7,651
	Under 10,000	40	1,596
Rural Local	Over 50,000	59	725
	25,000-50,000	40	916
	Under 25,000	36	2,379
Urban Interstate	Over 100,000	64	9,992
	50,000-100,000	69	783
	Under 50,000	60	134
Urban Arterial	Over 100,000	57	15,306
	25,000-100,000	52	15,264
	Under 25,000	48	1,895
Urban Collector or Local	All	59	2,416
ALL	All	54	97,057

TABLE 4. FRONT-SEAT PASSENGER (AGE 4-5 YEARS) USAGE RATES

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	100	1
	50,001-100,000	70	20
	25,001-50,000	47	19
	10,000-25,000	94	18
	Under 10,000	73	11
Rural Arterial	Over 50,000	70	33
	25,001-50,000	62	86
	10,000-25,000	49	137
	Under 10,000	48	31
Rural Collector	Over 100,000	78	9
	50,001-100,000	72	25
	25,001-50,000	60	96
	10,000-25,000	54	110
	Under 10,000	56	18
Rural Local	Over 50,000	67	12
	25,000-50,000	69	26
	Under 25,000	53	40
Urban Interstate	Over 100,000	81	114
	50,000-100,000	88	8
	Under 50,000	67	3
Urban Arterial	Over 100,000	70	184
	25,000-100,000	59	239
	Under 25,000	62	48
Urban Collector or Local	All	77	43
ALL	All	65	1,331

TABLE 5. FRONT-SEAT PASSENGER (AGE 6-12 YEARS) USAGE RATES

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	75	4
	50,001-100,000	67	27
	25,001-50,000	81	31
	10,000-25,000	69	45
	Under 10,000	70	10
Rural Arterial	Over 50,000	60	88
	25,001-50,000	59	147
	10,000-25,000	52	187
	Under 10,000	44	45
Rural Collector	Over 100,000	80	10
	50,001-100,000	63	51
	25,001-50,000	63	141
	10,000-25,000	47	155
	Under 10,000	33	15
Rural Local	Over 50,000	52	29
	25,000-50,000	53	30
	Under 25,000	45	64
Urban Interstate	Over 100,000	76	161
	50,000-100,000	73	15
	Under 50,000	100	2
Urban Arterial	Over 100,000	64	231
	25,000-100,000	58	323
	Under 25,000	56	50
Urban Collector or Local	All	68	62
ALL	All	61	1,923

TABLE 6. FRONT-SEAT PASSENGER (AGE 13-19 YEARS) USAGE RATES

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	47	19
	50,001-100,000	53	75
	25,001-50,000	65	101
	10,000-25,000	58	107
	Under 10,000	69	32
Rural Arterial	Over 50,000	38	167
	25,001-50,000	45	349
	10,000-25,000	39	512
	Under 10,000	33	103
Rural Collector	Over 100,000	48	25
	50,001-100,000	47	156
	25,001-50,000	44	303
	10,000-25,000	43	428
	Under 10,000	25	64
Rural Local	Over 50,000	60	68
	25,000-50,000	26	70
	Under 25,000	32	170
Urban Interstate	Over 100,000	59	429
	50,000-100,000	64	42
	Under 50,000	38	8
Urban Arterial	Over 100,000	53	647
	25,000-100,000	46	729
	Under 25,000	44	105
Urban Collector or Local	All	60	170
ALL	All	47	4,879

TABLE 7. FRONT-SEAT PASSENGER (OVER 19 YEARS OF AGE) USAGE RATES

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	77	124
	50,001-100,000	70	394
	25,001-50,000	73	607
	10,000-25,000	70	545
	Under 10,000	58	156
Rural Arterial	Over 50,000	55	831
	25,001-50,000	55	1,476
	10,000-25,000	51	1,925
	Under 10,000	51	379
Rural Collector	Over 100,000	63	156
	50,001-100,000	51	465
	25,001-50,000	48	1,119
	10,000-25,000	47	1,603
	Under 10,000	41	356
Rural Local	Over 50,000	58	166
	25,000-50,000	46	265
	Under 25,000	38	506
Urban Interstate	Over 100,000	65	1,605
	50,000-100,000	71	234
	Under 50,000	59	37
Urban Arterial	Over 100,000	61	2,433
	25,000-100,000	55	2,616
	Under 25,000	55	385
Urban Collector or Local	All	58	379
ALL	All	56	18,762

TABLE 8. USAGE RATES FOR CHILDREN 1-3 YEARS OF AGE (FRONT AND REAR)

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	75	12
	50,001-100,000	92	40
	25,001-50,000	83	53
	10,000-25,000	94	53
	Under 10,000	80	20
Rural Arterial	Over 50,000	85	71
	25,001-50,000	77	177
	10,000-25,000	64	224
	Under 10,000	49	37
Rural Collector	Over 100,000	92	13
	50,001-100,000	78	54
	25,001-50,000	72	154
	10,000-25,000	73	252
	Under 10,000	71	52
Rural Local	Over 50,000	78	27
	25,000-50,000	86	28
	Under 25,000	81	67
Urban Interstate	Over 100,000	93	258
	50,000-100,000	89	19
	Under 50,000	100	3
Urban Arterial	Over 100,000	80	418
	25,000-100,000	84	445
	Under 25,000	81	77
Urban Collector or Local	All	90	93
ALL	All	80	2,647

TABLE 9. USAGE RATES FOR CHILDREN UNDER 1 YEAR OF AGE (FRONT AND REAR)

TYPE OF HIGHWAY	COUNTY POPULATION	USAGE RATE (PERCENT)	SAMPLE SIZE
Rural Interstate	Over 100,000	100	1
	50,001-100,000	100	9
	25,001-50,000	100	11
	10,000-25,000	100	10
	Under 10,000	100	3
Rural Arterial	Over 50,000	94	17
	25,001-50,000	84	38
	10,000-25,000	82	51
	Under 10,000	100	9
Rural Collector	Over 100,000	100	2
	50,001-100,000	87	15
	25,001-50,000	93	28
	10,000-25,000	93	41
	Under 10,000	100	8
Rural Local	Over 50,000	100	3
	25,000-50,000	100	3
	Under 25,000	100	8
Urban Interstate	Over 100,000	98	59
	50,000-100,000	100	3
	Under 50,000	100	2
Urban Arterial	Over 100,000	86	196
	25,000-100,000	88	101
	Under 25,000	100	11
Urban Collector or Local	All	91	35
ALL	All	93	564

TABLE 10. USAGE RATES FOR DRIVERS AND PASSENGERS BY TYPE OF HIGHWAY

TYPE OF HIGHWAY	PERCENT USAGE		
	DRIVERS	FRONT-SEAT PASSENGERS	CHILDREN UNDER FOUR YEARS OF AGE
Rural Interstate	70	69	89
Rural Arterial	50	51	73
Rural Collector	48	48	77
Rural Local	41	44	83
Urban Interstate	65	67	94
Urban Arterial	54	57	83
Urban Collector or Local	59	62	91
ALL	54	56	82

TABLE 11. STATEWIDE USAGE RATE BY AGE AND SEX OF DRIVER

CATEGORY	USAGE RATE (PERCENT)
Male	47
Female	65
16-30 Years of Age	51
31-50 Years of Age	55
Over 50 Years of Age	58

TABLE 12. STATEWIDE USAGE RATE FOR FRONT SEAT PASSENGERS BY AGE CATEGORY

CATEGORY	USAGE RATE (PERCENT)
Under 4	69
4 - 5	65
6 - 12	61
13 - 19	47
Over 19	56

TABLE 13. CHANGE IN USAGE OF SAFETY BELTS BY DRIVERS IN ORIGINAL STATEWIDE SURVEY CITIES

	PERCENT USING SAFETY BELTS														
CITY	1982	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Louisville	6	12	13	14	16	25	28	38	70	66	60	66	66	61	65
Lexington	8	10	10	17	24	31	42	80	69	61	65	70	66	68	60
Covington	8	9	12	16	22	28	32	39	37	51	58	59	58	60	59
Hopkinsville	3	3	4	6	10	20	21	24	27	30	27	63	58	54	55
Frankfort	5	7	7	11	14	19	24	38	38	46	44	63	64	63	56
Henderson	3	5	7	9	11	20	22	29	29	29	32	62	54	56	53
Newport	5	6	5	6	9	20	26	35	34	34	29	39	45	42	44
Madisonville	2	3	5	8	12	20	22	26	26	27	28	70	63	62	60
Elizabethtown	3	4	5	8	14	20	26	31	34	39	34	60	55	58	60
Winchester	2	3	6	9	12	25	33	37	35	38	32	59	55	55	52
Glasgow	3	3	3	5	6	12	15	19	27	29	26	53	44	46	39
Somerset	2	4	6	7	9	19	26	21	29	28	28	59	54	54	51
Maysville	2	3	6	6	13	19	25	29	34	33	34	54	47	48	50
Morehead	3	3	3	5	7	12	15	22	23	26	28	59	53	50	50
Princeton	2	2	2	3	6	12	15	17	19	20	21	54	45	48	46
Bardstown	4	4	6	7	13	19	21	23	30	40	45	58	50	47	49
Hazard	4	3	4	6	5	10	12	15	19	19	29	52	49	52	54
Lawrenceburg	1	2	3	6	5	9	15	19	22	24	23	43	40	44	45
Carrollton	3	5	5	7	10	16	19	35	34	30	31	51	47	45	43

TABLE 14. CHANGE IN USAGE OF SAFETY SEATS OR BELTS BY CHILDREN UNDER FOUR YEARS OF AGE IN ORIGINAL STATEWIDE SURVEY CITIES

	PERCENT USING SAFETY SEATS OR BELTS														
CITY	1982	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Louisville	22	36	49	42	40	68	65	80	86	87	83	88	89	85	84
Lexington	32	46	50	44	46	78	78	91	90	87	81	83	77	84	89
Covington	22	39	49	47	50	59	53	66	67	72	84	74	86	81	92
Hopkinsville	12	19	19	20	21	33	38	40	51	54	56	76	78	80	82
Frankfort	15	26	30	27	30	43	43	57	72	72	62	97	75	88	83
Henderson	14	18	26	30	31	36	42	53	53	58	58	78	76	83	88
Newport	11	27	20	22	22	60	60	57	75	57	46	63	80	64	83
Madisonville	12	18	29	35	38	52	51	54	60	57	59	86	85	90	91
Elizabethtown	11	27	34	30	32	41	42	51	46	63	71	69	57	88	89
Winchester	12	14	33	29	26	56	68	51	53	58	64	74	72	76	80
Glasgow	14	17	20	18	21	36	38	39	47	50	36	67	61	70	74
Somerset	7	23	24	22	26	48	47	48	62	54	61	60	61	82	79
Maysville	12	18	17	19	25	31	34	36	55	58	62	70	58	70	66
Morehead	10	14	13	15	14	25	27	35	51	61	62	72	85	87	87
Princeton	10	12	12	16	20	33	41	52	52	53	60	71	71	70	89
Bardstown	20	21	31	31	31	41	39	42	76	67	75	84	76	79	91
Hazard	7	10	9	11	13	19	20	25	34	50	40	65	61	76	66
Lawrenceburg	7	6	22	23	20	32	29	35	77	65	41	52	59	52	78
Carrollton	6	10	16	22	19	26	28	31	45	62	43	62	56	81	81

TABLE 15. 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	1,820	0.73	567	0.07	90**
Incapacitating	12,732	5.09	14,617	1.79	65**
Non-Incapacitating	21,534	8.61	34,857	4.28	50**
Possible Injury	22,258	8.90	56,364	6.92	22**
Fatal or Incapacitating	14,552	5.82	15,184	1.86	68**

* Based on 1992 through 1996 accident data. Total sample size for not wearing a safety belt was 250,037 compared to 814,565 for wearing a safety belt.

** Statistically significant reduction (probability of 0.99).

TABLE 16. ACCIDENT SEVERITY VERSUS SAFETY BELT USAGE BY TYPE OF VEHICLE, SPEED LIMIT, AND TYPE OF ACCIDENT (ALL 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	5.93	1.92	68
	Single-Unit Truck	3.15	0.88	72
	Combination Truck	4.17	1.20	71
Type of Accident (Non-Intersection)	Rear End	2.48	1.10	56
	Fixed Object	16.53	5.26	68
	Head-On	24.38	10.97	55
	Overturned	22.02	7.98	64
Speed Limit (mph)	35	4.00	1.33	67
	45	5.63	1.88	67
	55	11.38	3.82	66

* Based on 1992 through 1996 accident data.

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

TYPE OF INJURY	NOT USING SAFETY SEAT OR BELT NUMBER	NOT USING SAFETY SEAT OR BELT PERCENT	USING SAFETY SEAT NUMBER	USING SAFETY SEAT PERCENT	USING SAFETY BELT NUMBER	USING SAFETY BELT PERCENT	PERCENT REDUCTION SAFETY SEAT	PERCENT REDUCTION SAFETY BELT
Fatal	18	0.20	25	0.09	5	0.02	53	88**
Incapacitating	325	3.67	190	0.72	246	1.20	80*	67**
Non-Incapacitating	699	7.89	754	2.85	599	2.93	64**	63**
Possible Injury	948	10.70	1,352	5.12	1,500	7.34	52**	31**
Fatal or Incapacitating	343	3.87	215	0.81	251	1.23	79**	68**

* Based on 1992 through 1996 accident data. Total sample sizes were 8,858 for not using a safety seat or belt, 26,422 for using a safety seat, and 20,424 for using a safety belt.

** Statistically significant reduction (probability of 0.99).

TABLE 18. 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 NUMBER	NOT USING SAFETY SEAT OR BELT PERCENT	USING SAFETY SEAT OR BELT NUMBER	USING SAFETY SEAT OR BELT PERCENT	PERCENT REDUCTION
Front	Fatal	11	0.18	11	0.06	70**
	Incapacitating	230	3.79	240	1.20	68**
	Non-Incapacitating	522	8.60	703	3.52	59**
	Possible Injury	697	11.48	1,529	7.65	33**
	Fatal or Incapacitating	241	3.97	251	1.26	68**
Rear	Fatal	7	0.21	19	0.07	66
	Incapacitating	95	2.86	196	0.75	74 **
	Non-Incapacitating	177	5.32	618	2.36	56**
	Possible Injury	276	8.30	1,264	4.82	42**
	Fatal or Incapacitating	102	3.07	215	0.82	73**

* Based on 1992 through 1996 accident data. Total sample sizes were 6,069 and 3,325 for not using a safety seat or belt in the front and rear seats, respectively, and 19,977 and 26,200 for using either a safety seat or belt in the front and rear seats, respectively.

** Statistically significant reduction (probability of 0.99).

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

TYPE OF INJURY	NOT USING LAP BELT OR SHOULDER HARNESS NUMBER	NOT USING LAP BELT OR SHOULDER HARNESS PERCENT	USING LAP BELT AND/OR SHOULDER HARNESS NUMBER	USING LAP BELT AND/OR SHOULDER HARNESS PERCENT	PERCENT REDUCTION
Fatal	810	0.56	281	0.09	84**
Incapacitating	8,145	5.62	6,297	1.97	65**
Non-Incapacitating	15,971	11.01	16,592	5.19	53**
Possible Injury	15,869	10.94	27,533	8.61	21**
Fatal or Incapacitating	8,955	6.18	6,578	2.06	67**

* Based on 1992 through 1996 accident data. Total sample sizes were 144,994 not using a safety belt or seat compared to 319,797 using a safety belt.

** Statistically significant reduction (probability of 0.99).

TABLE 20. ACCIDENT SEVERITY VERSUS SAFETY BELT USAGE BY SEATING POSITION (OCCUPANTS OTHER THAN DRIVERS)*

SEATING POSITION	TYPE OF INJURY	NOT USING LAP BELT OR SHOULDER HARNESS NUMBER	NOT USING LAP BELT OR SHOULDER HARNESS PERCENT	USING LAP BELT AND/OR SHOULDER HARNESS NUMBER	USING LAP BELT AND/OR SHOULDER HARNESS PERCENT	PERCENT REDUCTION
Front	Fatal	614	0.60	219	0.10	84***
	Incapacitating	6,050	5.93	4,921	2.22	63***
	Non-Incapacitating	11,604	11.36	12,277	5.53	51***
	Possible Injury	11,594	11.36	20,824	9.37	17***
	Fatal or Incapacitating	6,664	6.53	5,140	2.31	65***
Rear**	Fatal	196	0.46	62	0.06	86***
	Incapacitating	2,095	4.88	1,376	1.41	71***
	Non-Incapacitating	4,367	10.18	4,315	4.42	57***
	Possible Injury	4,275	9.97	6,709	6.87	31***
	Fatal or Incapacitating	2,291	5.34	1,438	1.47	72***

* Based on 1992 through 1996 accident data. Total sample sizes were 102,104 and 42,890 for not using a safety belt in the front seat and rear seat, respectively, and 222,160 and 97,637 for using a safety belt in the front and rear seat, respectively.

** Lap belts only primarily used in rear seats.

*** Statistically significant reduction (probability of 0.99).

TABLE 21. 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 SAVINGS MILLION $ FROM REDUCTION IN		
	FATALITIES	SERIOUS INJURIES**	FATALITIES	SERIOUS INJURIES	TOTAL
60	81	527	121.5	20.6	142.1
70	159	1,053	238.5	41.1	279.6
80	236	1,580	354.0	61.6	415.6
90	314	2,107	471.0	82.2	553.2
100	391	2,634	586.5	102.7	689.2

* Based on increase from the 55% usage rate determined in the 1996 survey, the percent reductions listed in Table 15, and accident cost estimates recommended by the Federal Highway Administration (18). These costs are $1,500,000 for a fatality and $39,000 for an incapacitating injury. The actual number of fatalities and incapacitating injuries for 1992 through 1996 were used along with the average usage rate over this time period.

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

TABLE 22. STATEWIDE USAGE RATES

YEAR	PERCENT USING SAFETY BELTS	
	DRIVERS	CHILDREN UNDER FOUR YEARS OF AGE*
1982	4	15
1983	6	24
1984	7	30
1985	9	29
1986	13	30
1988	21	48
1989	26	49
1990	32	57
1991	39	57
1992	41	62
1993	42	61
1994	58	72
1995	54	66
1996	55	79
1997	54	82

* Children using either safety seat or safety belt.
Children seated in either front or rear seat.

APPENDIX

SUMMARY OF DATA

LIST OF SURVEY LOCATIONS

1 Fayette, I64 at KY 859
2 Boyd, I64 at US 23
3 Christian,I24 at US 41A,Hopkinsville
4 Hardin, I65 at rest area, Sonora
5 Barren, I65 at KY 70, Cave City
6 Boone, I75 at rest area, Florence
7 Clark, I64 at KY 627, Winchester
8 Franklin, I64 at US 60, Frankfort
9 Laurel, I75 at KY 80, London
10 Henry, I71 at KY 153, Sligo
11 Rockcastle, I75 at US 25, Mt. Vernon
12 Scott, I75 at rest area, Georgetown
13 Shelby, I64 at KY 53, Shelbyville
14 Woodford, I64 at KY 341, Midway
15 Trigg, I24 at US 68, Cadiz
16 Pike, US 460 at KY 122, Shelbiana
17 Daviess, US 60 at KY 144, Owensboro
18 Hardin, US 31W at BR US 31W, West Point
19 Perry, KY 15X at KY 476, Hazard
20 Knox, US 25E at KY 225, Barbourville
21 Harlan, US 119 at KY 179, Cumberland
22 Floyd, KY 80 at US 23, Allen
23 Bullitt, US 31E at KY 44, Mt. Washington
24 Carter, KY 1 at I64, Grayson
25 Laurel, US 25 at KY 80, London
26 Mason, US 62 at KY 11, Maysville
27 Clay, US 421 at KY 80, Manchester
28 Bourbon,US68 at 5th St., Millersburg
29 Casey, US 127 at KY 70, Liberty
30 Meade, US 31W at KY 1638, Muldraugh
31 Lincoln, US127 at KY 78, Hustonville
32 Russell,US127 at KY80,Russell Sprgs.
33 Washington,US 150 at KY 55, Springfield
34 Cumberland, KY 90 at KY 61, Burkesville
35 Ballard, US 60 at KY 358, LaCenter
36 Fayette, KY 418 at I75, Lexington
37 Christian, US 41 at KY 1682, Hopkinsville
38 McCracken, US 62 at US 68, Reidland
39 Madison, KY 52 at KY 876, Richmond
40 Barren, KY 255 at US 31W, Park City
41 Nelson, US 62 at KY 48, Bloomfield
42 Boone, KY 18 at KY 237, Burlington
43 Oldham, KY 146 at KY 393, Buckner
44 Knox, KY 11 at US 25E, Barbourville
45 Henderson, KY 145 at US 60, Corydon
46 Boyle, US 68 at US 150, Perryville
47 Greenup, KY 1 at US 23, Greenup
48 Caldwell,KY 139 at Jefferson, Princeton
49 Grayson, US 62 at KY 259, Leitchfield
50 Allen, US 231 at US 31E, Scottsville
51 Bath, US 60 at KY36, Owingsville
52 Larue, KY 84 at KY 61, Hodgenville
53 Scott, US 62 at I75, Georgetown
54 Anderson, US 127 at US 127B, Lawrenceburg
55 Breathitt, KY 30 at KY 15, Jackson
56 Webster, US 41 at KY 56, Sebree
57 Garrard, KY 39 at US 27, Lancaster
58 Carroll, US 42 at 6th Street, Carrollton
59 Elliott, KY 32 at KY 7, Sandy Hook
60 McCracken, KY 1286 at US 62, Paducah
61 Harlan, KY 840 at US 119, Loyall
62 Greenup, KY 7 at US 23, South Shore
63 Lewis, KY 10 at KY 57, Tollesboro
64 Simpson, KY 73 at KY 100, Franklin
65 Adair, KY 55 at KY 80, Columbia
66 Taylor, KY 208 at US 68, Campbellsville
67 Kenton, I275 at KY 17, Covington
68 Kenton,I75 at KY 371, Crescent Springs
69 Fayette, I75 at US 68, Lexington
70 Jefferson, I64 at KY 1747, Louisville
71 Jefferson, I65 at KY 1631, Louisville
72 Jefferson, I264 at US 31E, Louisville
73 Jefferson, I264 at US 42, Louisville
74 Jefferson, I264 at US 60, Louisville
75 Warren, I65 at US 231, Bowling Green
76 Boone, I71 at KY 14, Verona
77 Jefferson, US 31W at Gagel, Louisville
78 Jefferson,KY 1447 at Hubbards, Louisville
79 Jefferson,KY 1703 at Trevillian,Louisville
80 Fayette, US 27 at KY 1683, Lexington
81 Fayette, Reynolds at Lansdowne, Lexington
82 Fayette, KY 4 at KY 353, Lexington
83 Kenton, US 25 at KY 236, Covington
84 Kenton, KY 8 at KY 17, Covington
85 Kenton, KY 16 at KY 177, Covington
86 Fayette, US 25 at Fontaine, Lexington
87 Campbell, US 27 at Carothers, Newport
88 Christian, US 41 at 9th, Hopkinsville
89 Hopkins, US 41A at KY 70, Madisonville
90 Pulaski, US 27 at KY 80, Somerset
91 Franklin, US 60 at Sunset, Frankfort
92 Henderson, US 41A at First St., Henderson
93 Nelson, US 31E at Beall, Bardstown
94 Barren, US 68 at Race St., Glasgow
95 Clark, US 60 at KY 1958, Winchester
96 Warren, US 31W at US 231, Bowling Green
97 Anderson, US 62 at US 127, Lawrenceburg
98 Rowan, US 60 at KY 32, Morehead
99 Hardin, Poplar at Sycamore, Elizabethtown
100 Kenton, KY 1072 at Highland, Covington

TABLE A-1. SUMMARY OF DATA

LOCATION NUMBER	DRIVERS		FRONT-SEAT PASSENGERS								FRONT AND REAR					
			4-5 Years		6-12 Years		13-19 Years		OVER 19 Years		UNDER 4 Years		1-3 Years		UNDER 1 Year	
	SAMPLE	USAGE*	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE
1	301	66	1	100	4	75	19	47	124	77	3	67	12	75	1	NA
2	553	61	4	25	7	43	34	56	114	58	3	100	14	86	2	100
3	505	67	10	80	13	69	26	46	119	67	3	100	9	89	3	100
4	319	73	6	83	7	86	13	62	161	81	2	100	17	100	4	100
5	403	67	1	0	5	100	27	74	129	72	2	100	17	65	0	NA
6	453	77	3	67	11	82	16	81	106	71	8	75	12	75	5	100
7	426	65	1	NA	3	67	20	50	71	72	1	100	2	100	1	100
8	635	75	3	67	2	100	14	64	146	75	1	NA	10	90	2	100
9	623	73	12	42	10	70	24	58	155	74	3	67	16	88	3	100
10	328	56	4	100	10	70	15	47	76	45	1	NA	8	75	1	100
11	465	77	5	80	5	60	17	65	166	78	2	100	11	100	3	100
12	353	77	3	100	12	67	20	55	109	75	2	100	10	90	2	100
13	368	64	3	100	12	83	22	77	104	81	5	100	12	100	2	100
14	247	69	3	100	6	50	33	48	90	56	2	100	13	92	2	100
15	381	71	11	73	10	70	32	69	156	58	5	40	20	80	3	100
16	920	52	4	50	8	50	34	29	223	46	4	25	17	76	3	67
17	1,345	56	20	70	57	60	73	38	276	54	23	87	42	88	10	100
18	1,460	61	9	78	23	65	60	42	332	61	6	67	12	83	4	100
19	1,642	54	17	59	40	63	95	43	322	54	18	67	51	61	7	100
20	1,342	51	11	45	9	56	36	44	236	56	5	60	16	69	4	75
21	725	45	4	50	11	45	42	33	162	46	5	40	11	64	2	100
22	1,004	62	8	63	16	75	50	56	215	66	2	50	14	79	2	100
23	494	56	12	67	9	67	22	32	109	56	4	100	16	94	2	100
24	1,073	48	8	88	19	63	33	45	186	58	11	73	31	94	11	64
25	1,743	53	26	62	43	51	71	49	246	48	12	83	38	84	10	90
26	1,528	50	18	61	19	47	71	39	367	54	29	41	65	63	12	83
27	1,129	34	18	22	33	39	125	27	277	35	13	38	38	61	2	50
28	889	52	16	44	21	43	86	48	221	54	12	83	22	86	3	100
29	774	28	18	33	23	52	38	45	209	41	9	22	24	46	2	50
30	1,627	60	25	68	30	50	74	45	335	61	6	83	18	78	10	90
31	404	50	10	60	16	81	29	45	128	51	2	50	10	60	3	100
32	896	41	21	62	32	56	48	31	215	50	8	75	24	71	15	73
33	885	43	11	27	13	69	41	49	173	55	5	40	23	57	1	100
34	866	35	17	35	25	28	45	33	189	43	7	14	24	38	5	100
35	1,001	43	14	64	20	65	58	33	190	58	6	67	13	69	4	100
36	1,070	63	9	78	10	80	25	48	156	63	2	100	21	71	2	100
37	857	50	10	60	21	62	58	47	144	44	5	40	19	79	5	100
38	1,090	56	7	86	20	60	69	46	198	56	2	50	16	81	3	67
39	1,435	57	8	75	10	70	29	52	123	51	8	50	19	74	7	86
40	267	46	5	60	2	50	15	53	82	49	3	0	9	56	1	100
41	399	38	13	38	19	58	32	28	102	40	3	33	19	47	2	50
42	1,386	53	36	64	62	66	75	44	178	62	20	65	55	71	11	100
43	941	54	17	71	19	53	55	58	194	55	8	50	25	84	6	83
44	571	39	3	33	5	60	20	35	126	44	2	50	8	63	2	100
45	428	42	3	33	9	56	31	35	88	41	1	0	7	57	1	100
46	446	47	6	17	5	60	25	36	113	42	2	50	13	85	3	100
47	1,003	49	13	92	20	75	50	50	236	41	1	0	19	89	2	100
48	1,351	46	14	64	38	61	88	45	259	38	6	83	33	91	5	80
49	1,460	47	16	56	26	35	49	51	381	50	13	85	29	83	11	91
50	561	45	7	43	15	53	26	42	144	49	6	83	16	88	2	100
51	964	26	17	24	20	20	50	22	152	18	21	43	52	58	10	90
52	231	43	7	71	7	43	14	50	50	62	3	33	9	78	0	NA
53	854	58	5	80	1	100	40	50	112	63	1	100	11	82	2	100
54	487	54	7	71	6	83	15	47	124	60	2	100	9	89	1	100

TABLE A-1. SUMMARY OF DATA (continued)

			FRONT-SEAT PASSENGERS								FRONT AND REAR					
	DRIVERS		4-5 Years		6-12 Years		13-19 Years		OVER 19 Years		UNDER 4 Years		1-3 Years		UNDER 1 Year	
LOCATION NUMBER	SAMPLE	USAGE*	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE	SAMPLE	USAGE
55	650	49	14	57	16	63	77	44	184	51	6	17	55	65	5	100
56	633	41	11	64	18	39	45	40	91	47	7	57	23	78	2	100
57	460	40	12	42	8	38	24	38	106	51	4	50	15	60	3	100
58	1,163	43	14	64	11	45	33	27	245	41	11	64	32	78	5	100
59	433	31	4	25	4	0	31	23	111	41	8	50	20	60	3	100
60	725	59	12	67	29	52	68	60	166	58	11	55	27	78	3	100
61	254	52	7	71	11	36	20	40	83	55	1	100	10	80	2	100
62	662	36	19	68	19	63	50	20	182	42	3	67	18	89	1	100
63	377	31	8	38	8	38	20	20	72	33	7	57	14	57	2	100
64	280	31	4	50	10	50	17	41	93	39	1	0	11	82	0	NA
65	1,552	36	23	57	40	48	119	31	291	38	10	70	37	89	6	100
66	170	48	5	60	6	33	14	43	50	36	1	0	5	80	0	NA
67	1,105	59	16	56	7	43	31	45	116	59	3	67	18	89	5	100
68	1,459	71	12	83	25	72	77	60	192	70	4	75	26	96	3	100
69	695	69	3	100	11	82	21	57	207	66	1	NA	14	86	1	100
70	1,249	70	13	100	22	82	57	81	289	71	9	89	36	97	3	100
71	1,836	56	21	81	40	70	109	49	310	56	14	93	50	88	13	100
72	1,466	61	29	83	26	88	71	61	290	62	16	94	54	98	21	100
73	1,275	68	12	83	19	74	34	56	116	69	11	100	30	97	7	100
74	907	67	8	75	11	82	29	69	85	78	5	60	23	83	6	83
75	783	69	8	88	15	73	42	64	234	71	2	100	19	89	3	100
76	134	60	3	67	2	100	8	38	37	59	2	NA	4	75	2	100
77	1,993	53	38	79	30	63	99	44	320	63	28	64	77	81	10	90
78	1,496	64	35	80	47	68	70	70	137	70	18	89	54	87	12	100
79	1,414	63	10	60	20	75	24	54	232	59	13	69	34	85	17	76
80	1,992	71	12	67	7	86	76	59	337	76	6	83	24	88	5	100
81	909	65	11	73	28	79	64	58	135	64	6	100	22	86	9	100
82	1,576	57	17	65	21	52	58	55	276	55	4	50	29	86	4	100
83	1,713	51	15	60	18	61	55	51	268	62	16	63	63	78	14	86
84	1,310	41	17	65	16	63	65	40	234	36	12	67	51	65	5	100
85	1,305	41	22	59	30	43	84	44	254	46	20	40	41	71	13	54
86	1,598	63	7	57	14	71	52	62	240	73	6	83	23	83	7	100
87	1,280	44	13	46	33	58	75	32	207	37	1	100	34	79	7	100
88	1,600	55	19	58	20	60	51	43	222	51	16	75	37	81	2	100
89	1,768	60	17	71	35	66	88	44	250	51	11	82	39	90	5	100
90	1,800	51	22	73	32	75	110	48	409	63	32	75	74	80	21	76
91	1,602	56	20	65	25	68	34	62	213	65	7	71	25	84	10	80
92	1,462	53	10	70	29	59	65	40	238	55	8	63	27	85	5	100
93	1,541	49	35	51	22	50	65	42	348	59	13	62	57	89	10	100
94	1,163	39	13	23	16	38	28	46	137	42	6	17	24	71	3	100
95	1,051	52	35	66	29	55	82	44	247	58	17	65	48	79	12	83
96	1,997	58	55	58	82	51	131	56	345	56	27	93	80	93	26	88
97	955	45	25	64	35	51	59	46	180	54	10	60	34	76	2	100
98	940	50	23	61	15	67	46	41	205	56	22	82	43	84	9	100
99	1,228	60	24	71	47	66	88	59	195	51	8	63	39	87	6	100
100	1,188	59	19	84	15	73	82	61	184	65	36	86	54	93	29	90