

UNIVERSITY OF NORTH CAROLINA
HIGHWAY SAFETY RESEARCH CENTER

SEAT BELTS: A PILOT STUDY OF
THEIR USE UNDER NORMAL DRIVING
CONDITIONS

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A B S T R A C T

This study was concerned with the actual use of seat belts by drivers observed when they passed a slow-moving panel truck in which the researchers rode. A total of 1,052 vehicles was observed, but final calculations were based on the 709 cases in which it was possible to judge definitely the age of the car, the registration of the car (in-state or out-of-state), the race and sex of the driver, and whether or not the driver wore a seat belt.

Seat belt usage was found to be related to several factors. First, the driver of a newer car (1964 and later) was more likely to be observed wearing a belt (32% of newer cars vs. 14% of older). All newer cars are equipped with seat belts. Second, drivers of cars bearing out-of-state license plates were more likely to be using belts than those driving in-state cars (36% of out-of-state vs. 24% of in-state). Third, white drivers were more likely to be wearing belts than nonwhite drivers (28% of whites vs. 10% of nonwhites). Fourth, and perhaps most surprising, male drivers were more likely to be wearing belts than female drivers (30% of men vs. 18% of women). However, for all groups there was great room for improvement. Only slightly more than one-fourth of the observed drivers were using belts at all, and when only newer cars were considered, this figure rose to only 32%.

There is a great need for educational efforts on behalf of belt usage, and perhaps for particular efforts aimed specifically toward nonwhites and women. Factors which were investigated but were not found to be significantly related to belt usage were the age of the driver (estimated), the presence or absence of passengers, and urban versus non-urban locale.

SEAT BELTS: A Pilot Study of Their Use Under
Normal Driving Conditions¹

INTRODUCTION AND METHOD

The use of seat belts in automobiles has been demonstrated to reduce injuries in case of collision.² The evidence in this regard is so convincing that since 1964 North Carolina law has required that all cars sold in this state be equipped with seat belts in the front seats. However, it is one thing to install seat belts and quite another to get people to use them. Information regarding the use of seat belts has been obtained primarily from questionnaires in which drivers are asked about their seat belt habits. Although such surveys report that 55% of the drivers questioned say they always use belts on long trips,³ there is ample evidence that frequently people say one thing and do another. Consequently, it is desirable to obtain reliable information regarding the actual use of seat belts under a variety of driving conditions.

This pilot study was aimed at obtaining information regarding the use of seat belts by passenger car drivers while such vehicles were actually

¹The authors wish to express their appreciation and thanks to William Rouse, Mason Adams, Floyd Oglesby, Allen Lytch, and Alfred Cooper, whose help made this study possible.

²B. Tourin, Ejection and automobile fatalities. Public Health Rep. 73:381-391, 1958.

B. Tourin and J. W. Garrett, Safety Belt Effectiveness in Rural California Automobile Accidents. Automotive Crash Injury Research of Cornell University, New York, Feb., 1960.

³Auto Industries Highway Safety Committee, News Release, October, 1967.

traveling on the highway. The data were obtained by a team of four observers in a panel truck. The truck's height was approximately two feet higher than a standard automobile. The truck traveled at a speed approximately 10 to 15 mph slower than the flow of traffic, and observations were made on the driver of a car as it approached the truck from the rear and passed it. The research team included the truck driver; a second man who sat in the rear of the truck and made observations concerning the make and year of the car, the number of passengers, and the sex, race, and approximate age of the driver; a third man who sat behind the truck driver and checked for seat belt usage by the driver of the car being observed; and a fourth man who recorded the information, including the license plate number of the observed car. In summary, then, data were obtained regarding the observed vehicle and the driver of the observed vehicle. Data were not obtained on other passengers in the car except to note that they were present.

The observations were made between June 18 and June 28, 1967, and included several different loop routes in order to sample several regions in North Carolina. All loops originated and ended in Chapel Hill, North Carolina, with the western loop running to Asheville, the eastern loop running to Morehead City and Wilmington, the southern loop to Laurinburg and Lumberton, and the two northern loops to Henderson and Roanoke Rapids. Observations in rural areas included standard two-lane roads and four-lane highways. In fact, more observations came from four-lane highways, because on winding two-lane roads there were limited opportunities for cars to pass the slower moving observer truck. Observations on urban streets were made in Chapel Hill and Raleigh.

A total of 1,052 vehicles was observed, and in 834 of these cases (79%) the observers were able to say with confidence that the driver was or was not wearing a seat belt. In the remaining 218 cases (21%) it was not possible to determine if a seat belt was being used. In some instances the car passed the survey truck at too great a speed. In other cases the driver wore loose clothing, such as a jacket, which made it impossible to see if a belt was being used. In the case of certain small foreign cars, particularly Volkswagens, the window opening was too high and the driver's seat too low for a reliable observation to be made. All these cases were classified as "Undetermined" and were not included in the final percentages. The observers were instructed to use the "Don't know" category freely. In other words they were to say "yes" or "no" regarding belts only when they were quite certain of their judgment.

The data sheet provided for the following observations:

Highway: A distinction was made between roads which were in town (urban) or out-of-town (non-urban).

Year and Make of Car: The make and year of observed vehicles were recorded when possible. The major concern was whether the car was a pre-1964 model or later. 1964 was the first year seat belts were required by North Carolina law. In some cases it was possible to read the make of car on the car body as it passed, but by and large classification by car make depended on the observers' knowledge and familiarity with car models and styles. No doubt a few of the cars classed as 1964 and later are actually pre-1964, and vice versa.

Registration: Whether the observed vehicle had a North Carolina license plate or was from out of state was noted. In the case of North Carolina cars, an attempt was made to record the actual license number.

Sex, Race, and Age of Driver: Judgments were made of the sex and race (white or nonwhite) of the driver. Four categories for approximate age of driver were used: teen-age, young adult (20-35), mature adult (36-55), and old (over 55).

Passengers: The number of passengers was recorded.

Seat Belt Usage: Whether or not the driver was observed to be wearing a seat belt was recorded.

Not every observation was made in every case; e.g., in a given instance it may not have been possible to determine the make of the car even though it was possible to record belt use. The final analyses reported here were based on the 709 cases in which judgments were made regarding all of the following: age of car (pre-1964 or later), car registration, driver race and sex, and whether or not a seat belt was worn by the driver.

All of these observations were made in a brief period, a few seconds at the most. In cases where the observers were uncertain or disagreed, an "Unknown" judgment was entered. Undoubtedly there are some classification and judgmental errors, but in terms of the key variables the authors are confident that the observations are basically trustworthy.

RESULTS

In 1964 cars, known to be equipped with belts, 32% of the drivers were using them. We feel this figure is the best indication of belt-wearing practices in North Carolina. However, the percentage of belt users for the total number of cars was lower (26%), because presumably most of the pre-1964 cars did not have belts, so the drivers couldn't wear them. Seat belt usage was found to vary significantly as a function of several factors. The major factors related to the use of seat belts by the driver were the age of the car, in-state or out-of-state registration, the sex of the driver, and the race of the driver. Other factors which were investigated but which did not show any significant relationship

to seat belt usage included the estimated age of the driver, the presence of passengers, and the location of the highway (urban or non-urban).

Age of Car: Drivers of older cars were less likely to be using seat belts than drivers of late model cars in which seat belt installation is required of the manufacturer (See Table 1). It was impossible to determine in this study if the driver of a pre-1964 vehicle had seat belts available unless he was observed using them. Nevertheless it is interesting to note that 14% of the owners of pre-1964 cars not only went to the effort and expense of equipping their vehicles with seat belts, but the drivers were observed using them. In the newer cars, which automatically come equipped with belts, the proportion of drivers using belts increased to 32%. This means that 68% of the drivers of cars with seat belts still did not use them, but the difference between 14% of belt users in old cars and 32% in new cars suggests that there are many drivers who will use belts if they are available, even though they may not install them in a car which does not come equipped with them. It may be that if only pre-1964 cars with belts are considered, most of the drivers use the belts, while in post-1964 cars with belts a lower proportion of drivers use them. Nevertheless, in terms of absolute numbers of drivers on the road using belts there is an increase when cars come automatically equipped with belts. In other words, the availability of safety equipment is a major factor in its utilization.

Perhaps what is most striking about these data is the large proportion of drivers who do not make use of seat belts even when their car comes equipped with them. Required installation of seat belts encourages their proper use, although it by no means insures it.

TABLE 1. BELT USE BY CAR AGE*

Car Age	Belts Used		Total
	Yes	No	
Pre-1964	27 (14%)	171 (86%)	198
1964 & later	161 (32%)	350 (68%)	511
Total	188	521	709

* $z = 4.84$, $p < .0001$, Helen M. Walker and Joseph Lev, Statistical Inference. New York: Henry Holt, 1953, page 78.

Registration of Car: The proportion of drivers using seat belts in observed vehicles bearing in-state license plates (24%) was smaller than the percentage of seat belt users in out-of-state cars (36%) (See Table 2). For the 1964 and later models, the figures increase to 29% for in-state and 42% for out-of-state cars.⁴ Perhaps this difference

TABLE 2. BELT USE BY REGISTRATION*

Registration	Belts Used		Total
	Yes	No	
Out-of-State	46 (36%)	81 (64%)	127
In-State	142 (24%)	440 (76%)	582
Total	188	521	709

* $z = 2.73$, $p = .01$, Helen M. Walker and Joseph Lev, Statistical Inference. New York: Henry Holt, 1953, page 78.

⁴ $z = 2.52$, $p < .02$, Helen M. Walker and Joseph Lev, op. cit.

can be explained by the fact that out-of-state drivers, many of whom are on interstate trips, are probably traveling greater distances than are in-state drivers. Other reports in the literature have indicated that the longer the trip, the greater the likelihood that a seat belt will be used.⁵

Race: While the proportion of nonwhite drivers observed was not large (only 7% of the total population where all observations were considered), nevertheless there were differences of note. In terms of overall belt use, it was found that 28% of the total number of white drivers were using belts, while only 10% of nonwhites were using them (See Table 3). While this difference was statistically significant, it should be pointed out that there was also a significant relationship between race and the age of the car driven; that is, nonwhites were more likely to be driving cars made prior to 1964 than were whites (45% of nonwhites vs. 27% of whites).⁶ When the age of vehicle was considered, it was found that there were no nonwhites using belts in pre-1964 cars compared to 16% of white drivers. In newer cars where belts were automatically provided, the difference between whites and nonwhites was not statistically significant, possibly because of the small sample of nonwhite drivers. Nevertheless, it was found that in newer automobiles 32% of the white drivers wore belts, while only 19% of the nonwhite drivers wore them. Buxbaum and Colton⁷ have reported a higher death rate from motor vehicle

⁵ Auto Industries Highway Safety Committee, op. cit.

⁶ $z = 2.74$, $p < .01$, Walker and Lev, op. cit.

⁷ R. C. Buxbaum and T. Colton, Relationship of motor vehicle inspection to accident mortality, JAMA, 197:31-36 (July 4) 1966.

accidents for nonwhites than for whites. However, they also report that the white-nonwhite difference in mortality decreases as a function of compulsory automobile inspections. Thus it appears that some safety programs may particularly benefit the nonwhite population. The percentage of belt users in both races is low and in need of improvement; nevertheless, there is some indication that there may be a special need for educational efforts aimed at nonwhite drivers in this regard.

TABLE 3. BELT USE BY RACE*

Race	Belts Used		Total
	Yes	No	
White	183 (28%)	477 (72%)	660
Nonwhite	5 (10%)	44 (90%)	49
Total	188	521	709

* $z = 2.68$, $p = .01$, Helen M. Walker and Joseph Lev, Statistical Inference. New York: Henry Holt, 1953, page 78.

Sex: Perhaps the most surprising results of this study concerned the difference in seat belt usage by sex of driver. While women are sometimes considered to be more cautious and safety conscious than men, our findings show that men are more likely to be found wearing seat belts. In newer cars (1964 and later), which came equipped with seat belts from the manufacturer, 36% of the men were found wearing belts compared to 21% of the women (See Table 4). This difference is highly significant. In pre-1964 cars, however, it was found that approximately the same proportion of men and women were wearing seat belts (14% of the

men and 12% of the women). We do not know what percentage of pre-1964 cars in our sample had seat belts available, although we can assume that the percentage would be relatively small. The fact that about the same proportion of men and women use belts in pre-1964 cars suggests that we may be dealing with a special sub-population. It may be that car owners who went to the special effort and expense to install seat belts after acquiring their cars consider belts to be of value and consequently wear them.

TABLE 4. BELT USE BY SEX AND AGE OF CAR

Car Age	Sex	Belts Used		Total
		Yes	No	
Pre-1964	Male	21 (14%)	126 (86%)	147
	Female	6 (12%)	45 (88%)	51
	Total	27	171	198
1964 & Later*	Sex	Yes	No	Total
	Male	135 (35%)	250 (65%)	385
	Female	26 (21%)	100 (79%)	126
	Total	161	350	511

* $z = 3.03$, $p < .01$, Helen M. Walker and Joseph Lev, Statistical Inference. New York: Henry Holt, 1953, page 78.

When the sex of the driver was analyzed according to both age of vehicle and registration (in-state or out-of-state), essentially the same results were found. In older cars the sex difference was not significant, while in newer cars it was quite significant for in-state

drivers (33% of the men and 18% of the women were wearing belts).⁸ However, for out-of-state drivers the sex difference was not statistically significant, although there was a trend toward a higher percentage of men using belts than women (43% of men and 39% of women). Again, perhaps out-of-state drivers represent a special sub-population in which sex differences tend to disappear, because, as noted above, people seem to recognize the value of seat belts for long trips.

Although there were too few nonwhite drivers to run statistical tests according to sex, the data nevertheless were examined. For white drivers the striking sex differences held up. Thirty-one percent of the white men were using belts, while only 18% of the white women wore them.⁹ For the nonwhite driver the sex differences were reversed; that is, nonwhite women seemed more likely to be wearing belts than nonwhite men (17% of the women and 9% of the men). The number of observations for nonwhites is quite low; the figures should be considered no more than a possible indication of seat belt usage by nonwhite men and women.

When the sex differences were analyzed according to the approximate age of the driver (teen, young adult, mature adult, and old adult), there were too few teen-age drivers to warrant statistical analysis. However, for the other age groups it was found that the only group showing significant sex differences was the young adult. Here 20% of the women and 32% of the men were found to be wearing seat belts.¹⁰

⁸ $z = 3.03$, $p < .01$, Helen M. Walker and Joseph Lev, op. cit.

⁹ $z = 3.06$, $p < .01$, Ibid.

¹⁰ $z = 2.18$, $p < .05$, Ibid.

It should be noted that it is this age group that includes most mothers of young children. Serious injury to these women would entail drastic consequences in terms of family disruption; furthermore, this group is most likely to be teaching young children safety habits, if not explicitly then by example. In regard to the teen-age drivers, although there were few observations, nevertheless it might be noted that 22% of teen-age male drivers were using belts. Such a proportion is similar to that of the women as a whole and of the men over 55.

It was found that the presence of passengers did not significantly affect the percentages of drivers using seat belts. While the male-female difference was evident with or without passengers, it was statistically significant only when passengers were present.¹¹

DISCUSSION AND RECOMMENDATIONS

This pilot study has shown seat belt usage to be related to several factors. First, seat belts are more likely to be used in newer cars which come equipped with belts than in older cars which do not have them unless the owner had them installed. While making seat belts standard equipment does not insure that they will be used, it is evident that it does increase the overall usage of belts.

A second factor found to be related to the use of belts is the in-state vs. out-of-state registration of the car. Drivers of out-of-state cars, presumably on longer trips than drivers of in-state cars, are more likely to be wearing seat belts than drivers with in-state license plates. Previous data indicate that people wear seat belts more often for longer

¹¹_z = 2.69, p = .01, Ibid.

trips than for short ones; however, there is evidence that four out of five accidents occur within 25 miles of the driver's home.¹² It appears, then, that the use of seat belts primarily for long trips may mean that belts are not being used when they are most needed.

A third factor found to be related to the use of seat belts is the race of the driver; nonwhite drivers are less likely to be observed wearing seat belts than are white drivers. Although our data may be related to economic factors (nonwhites were observed driving pre-1964 cars more frequently than whites), the difference is apparent in cars where belts are standard equipment. There may be a special need for safety instruction for the nonwhite driver.

Fourth, the data have shown a striking sex difference in seat belt usage in favor of men. Although this difference is not significant for pre-1964 cars or for out-of-state cars, for the population as a whole the sex difference was statistically highly significant.¹³ When subgroups are analyzed, even when sex differences are not statistically significant, they invariably favor the male driver, with the one exception of nonwhite drivers. This single exception was the only instance in which women drivers seemed more likely to be using belts than men.

The fact that women were less likely than men to be observed wearing belts raises at least two points. First, women, more than men, are likely to be disturbed by disfigurement. The use of seat belts will often prevent the driver or passenger from smashing through the windshield or slamming into the dashboard and thus help to avoid facial injury and disfigurement.

¹²Auto Industries Highway Safety Committee, op. cit.

¹³ $z = 2.94$, $p < .01$, Helen M. Walker and Joseph Lev, op. cit.

Yet women are less likely to use seat belts so as to prevent such injury. Second, and perhaps more important, is the fact that women for the most part are instructing children in safety habits, and it is the younger generation that is of particular concern in highway safety education. By the time today's children are driving, traffic will be heavier and speed will be greater than it is today. The results of this study indicate that a special educational effort should be directed toward women with regard to the safety value of seat belts and to the woman's role as an example for tomorrow's drivers.

Perhaps the most important fact to come from this study is the relatively poor showing of all groups. In newer cars which come equipped with belts only 32% of the drivers were observed wearing them. We do not know why people do not wear belts when they are available. There is a need to discover the reasons and to promote educational efforts directed toward increasing the use of this safety device.

Once educational campaigns are instituted, it should be possible to obtain some measure of their effectiveness through the methods described in this study. Unfortunately one cannot rely on the verbal reports of drivers as a true indication of their actual use of seat belts. Studies in which observations of drivers on the roadway are made, however, can supply accurate information about the seat belt habits of the population.

This study has presented data on the actual use of seat belts in typical driving situations. We are further interested in knowing if the safety habits of drivers involved in accidents differ from the driving population in general. A report in the near future will provide information on the use of seat belts by drivers involved in accidents in

North Carolina during approximately the same time period that this study was conducted. Such information should indicate whether the population involved in accidents differs significantly in seat belt usage from the general driving population, that is, the population at risk.