

**Seat Belt Use by High School Students**

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## ABSTRACT

**Objective:** To determine seat belt use of teenage drivers arriving at high schools in the morning and at evening football games compared with belt use of adults driving teenage passengers to these events, and teenage passenger belt use depending on whether they were being driven by another teenager or an adult.

**Methods:** Unobtrusive observations of belt use were made at 12 high schools in Connecticut and Massachusetts.

**Results:** Among males, teenage drivers had lower belt use than adults; differences between female teenage and adult drivers were slight. Teenage passengers had lower belt use in vehicles driven by other teenagers than in cars driven by adults, but more than 40 percent of teenage passengers in vehicles driven by adults, presumed in most cases to be the teenager's parent, were not belted. Teenage passenger belt use was lower than teenage driver use regardless of gender. These differences were found both at morning arrivals and at football games, but teenage belt use was not much different in these two settings. Teenage passengers were belted more often if drivers were belted, whether the driver was another teenager or an adult, but a third of male passengers and 25-30 percent of female passengers were unbelted even when drivers were belted.

**Conclusion:** Teenagers have high crash risk but low belt use, which adds to their injury problem. Avenues to address this include building belt use requirements into graduated licensing systems, keeping young beginners out of high-risk driving situations, and finding ways to influence parents and other adults to ensure that their teenage passengers use seat belts.

## INTRODUCTION

Teenage drivers have higher crash risk than adults. Yet studies have found that many teenagers do not use seat belts, making them more vulnerable to crash injuries. In one series of studies, seat belt use of student drivers arriving at high schools was observed at the same Maryland schools in 1982, 1988, and 1995 (Wells et al., 1989; Williams et al., 1983; Williams et al., 1997). Maryland's seat belt use law went into effect in 1986, so these studies allowed tracking of belt use rates before and after the law and over time. Remarkable progress has been achieved. For example, at one high school, driver belt use was 1 percent in 1982, 29 percent in 1988, and 52 percent in 1995. At another, belt use rose from 3 to 44 to 68 percent. In all the surveys, however, high school drivers were generally less likely than adult drivers in the surrounding community to be belted, although in the 1995 survey there was some evidence that student and adult use rates were converging. That is, belt use by student drivers was the same as adult driver use at one of the high schools and higher at another, whereas in prior surveys student belt use was lower than adult use at all the schools.

Belt use by teenage passengers, however, is consistently lower than adult passenger use and much lower than teenage driver use. In the 1995 high school survey, teenage passenger use averaged about 20 percentage points lower than for teenage drivers. An extensive observational study of drivers and front seat passengers conducted in 1995 found differences of 4-14 percentage points between teenage and adult belt use in eight cities in four states, with teenage front seat belt use ranging from 20 to 58 percent (Womack et al., 1997). Clearly low belt use by teenage drivers and passengers adds to their motor vehicle injury problem.

Since 1995, graduated licensing systems for young beginners have been introduced in most states. These systems are premised on reducing exposure to high-risk driving situations while people are learning, most notably late-night travel and travel with passengers. Crash risk increases incrementally with the number of passengers (Chen et al., 2000). A recent study addressing the situational nature of seat belt use among fatally injured drivers found that belt use among teenage drivers who died was lowest in these high-risk situations, i.e., late at night and when with passengers, especially multiple passengers (Williams and Shabanova, in press). Belt use by fatally injured teenage passengers also decreased as vehicle occupancy increased. These findings show the importance of restricting these activities, not only because of the higher crash risk but because of the extra injury likelihood. They also raise the question of whether belt use in general should be addressed in graduated licensing systems.

The situational belt use study was based on fatally injured drivers and passengers. In the present study observations of belt use were made at high schools in two states. Two situations were observed: when arriving in the morning to attend classes and when arriving for a Friday evening football game. Observations were made of teenage drivers, adult drivers transporting teenagers (presumably mostly parents), and teenage front-seat passengers. The study provided the opportunity to update information on belt use of high school drivers and passengers. It also allowed belt use to be assessed in a recreational setting, one that may have somewhat higher crash risk than driving to high school in the morning. The study design also allowed a comparison of teenage belt use rates with that of adults arriving at the schools; an assessment of belt use of teenage drivers and passengers in relation to the number and types of other occupants in the vehicle; and an assessment of the relationship between teenage passenger and driver belt use, depending on whether the driver was an adult or another teen.

## **METHODS**

Observations of seat belt use were made at 12 high schools in the fall of 2001. Six public high schools were selected in each of two contiguous Northeastern states, Connecticut and Massachusetts. Connecticut has a primary seat belt law (i.e., police may stop vehicles solely for belt law violations) and Massachusetts has a secondary seat belt law.

## **Selection of Schools**

A sample of six schools in each state was sought that would represent a balanced cross section of school districts in terms of socio-demographic characteristics and location. In addition, schools were sought that would yield an adequate sample of seat belt observations and would permit the unobtrusive and accurate observation of almost all students arriving in a passenger vehicle in the morning and at a football game.

A variety of socio-demographic and other information was gathered for all the high schools in each state from the websites of state government agencies and the U.S. Census. This information included county, per capita annual income and population density of the school district, percentage of the teenage population attending public schools, school enrollment by grade, and the ethnic and racial profile of the student body. Based on a review of this information, some schools were excluded from consideration: private, vocational/technical, and charter schools, and schools with fewer than 400 students enrolled in the junior and senior classes combined. In Massachusetts, schools within ten miles of Boston and schools on Cape Cod, Nantucket, and Martha's Vineyard were excluded because there were no comparable areas in Connecticut. In addition, four schools in Connecticut that served a school district with a per capita annual income greater than \$55,000 were excluded.

There remained approximately 75 schools in each state. Additional information for these schools was obtained from school websites and phone conversations with school administrative staff. This information included the layout of the school campus and all entrance and egress routes, the student parking capacity, whether there was an on-campus football stadium, and approximate attendance at football games. Although most of the schools provided limited assigned parking for students who drove to school, parking at athletic events was generally unassigned. It was determined that conducting observations on public streets at all school entrances would maximize the ability to conduct unobtrusive observations and yield the largest and most representative sample at each school.

The following additional criteria were used to evaluate each school's suitability:

- School parking spaces for at least 200 students
- Limited access to and from public streets
- The ability to position observers on public, rather than school, property
- Adequate overhead nighttime lighting at the entrances/exits
- An on-campus football stadium
- Well-attended football games with most parking on-campus

Based on these criteria, many schools were eliminated. Site visits were made to 24 Connecticut and 33 Massachusetts schools that appeared promising. Detailed maps of the campus and adjacent streets were drawn, and student parking capacity and the adequacy of lighting were verified. From the schools

that best met the criteria for collecting a valid and representative sample of observations, six schools were selected in each state that provided a mix of rural, suburban, and urban settings and a range of per capita annual income. The per capita annual income ranged from \$21,915 to \$30,220 for the six Connecticut school districts and from \$22,771 to \$32,088 for the six Massachusetts school districts. The states' samples of schools were well-matched in terms of population density; in each state there were four school districts with population density between 1,000 and 2,000 population/square mile, one district with population density less than 500 persons/square mile, and one district with population density greater than 2,000 persons/square mile.

Prior to the survey, a letter was sent to the principals of the 12 schools. The letter described the study and its purpose, explained that unobtrusive observations would be conducted on public streets and in close proximity to the school campus, and explained that the local police agency would be notified about the observations. The letter also provided reassurances that there would be no direct contact with students and requested that the survey not be discussed with students or staff, since that might influence students' behaviors.

### **Seat Belt Observations**

Observation data were collected from October 5 to November 16, 2001. At each school, students were observed as they arrived at school on a Thursday or Friday morning, and as they arrived at a Friday evening football game. For all but two schools, the morning and evening observations were conducted on the same day. Due to inclement weather and a school holiday, the morning observations at the remaining schools were conducted on the Thursday following the evening observations. All the football games began between 6:00 p.m. and 7:00 p.m., and observations began approximately one hour earlier. All the schools started classes at approximately 7:30 a.m. and observations began approximately one-half hour earlier.

Observations were conducted by teams of two observers standing side by side at each entrance/exit to the school campus, excluding entrances/exits used solely for school bus drop-offs. Observers stood on public property at all but one school, where the principal invited the observers onto school grounds in order to maximize the number of vehicles that could be observed. Between four and eight observers were required at each school.

Observations were conducted only for those vehicles with a teenage driver or teenage front-seat outboard passenger. The following information was collected for qualifying vehicles: driver gender, estimated age (student, young adult 20-25 years, adult 25 years and older), and shoulder belt use; front-seat outboard passenger gender, age, and shoulder belt use; number of back-seat passengers; license plate number. For each vehicle, the collection of these data was divided between the two observers. Observer

1 recorded the information on front-seat occupants on a data sheet (i.e., gender, age, and belt use for the driver and outboard passenger). Observer 2 recorded the number of back-seat passengers and license plate number, using a hand-held tape recorder. The observers attempted to observe each qualifying vehicle passing through the entrance; Observer 2 called out “skipped” for a qualifying vehicle that could not be observed because of heavy traffic flow. To ensure that the two observers were completely synchronizing their efforts, Observer 1 called out the number of every tenth vehicle.

In all, data were collected for 3,638 vehicles (1,434 in Massachusetts and 2,204 vehicles in Connecticut) during the morning observations and for 1,966 vehicles (957 vehicles in Massachusetts and 1,009 in Connecticut) during the evening observations. An additional 674 vehicles (378 in Massachusetts and 296 in Connecticut) were “skipped” during the morning observations; 58 vehicles (32 in Massachusetts and 26 in Connecticut) were skipped during the evening observations.

## **Analysis**

A computer record was created for each observation by integrating the data from the written forms and the tape recorder. All the written and recorded data were verified by a second analyst. In addition to the record created for each observation, a record was created for each vehicle that was observed during both the morning and evening observations, based on the vehicle plate number. For these matched-plate sets of observations, a driver was considered to be the same person if both the gender and the age group matched in the morning and evening observations.

Initial analysis indicated few important between-state differences in observed patterns of belt use. Therefore, the data from the two states were combined in all subsequent analyses. The mean number of observations conducted per school was 467 (including both morning and evening observations), and the number of observations per school ranged from 362 to 703. All analyses reported here were conducted with data weighted to equalize the sample sizes across the 12 schools. The weights ranged from 0.66 to 1.29. Chi-square tests were used to assess statistical significance.

## **RESULTS**

Based on the weighted sample, observations of shoulder belt use were made for 2,899 teenage drivers, 2,612 adult drivers, and 4,206 front-seat teenage passengers at the 12 high schools. Fifty-six percent of the teenage drivers were male, compared with 41 percent of the adult drivers and 46 percent of the teenage passengers. For teenage passengers, 2,582 were traveling with adult drivers and 1,624 were with teenage drivers. There were 6,152 total belt observations made at morning arrival and 3,565 at the football games. Tables 1-3 provide the main results.

**Table 1**  
**Seat Belt Use of Teenage and Adult Drivers Arriving at 12 High Schools in Connecticut and Massachusetts in the Morning and for Evening Football Games**

		Percent Use (N)			
		Teenagers		Adults	
		Morning	Football	Morning	Football
Connecticut	1	41 (168)	43 (51)	55 (192)	58 (43)
	2	58 (130)	53 (111)	64 (98)	80 (120)
	3	64 (157)	57 (75)	63 (166)	76 (51)
	4	67 (109)	67 (72)	72 (199)	76 (70)
	5	70 (152)	49 (57)	69 (185)	49 (65)
	6	81 (140)	55 (65)	74 (156)	78 (93)
Massachusetts	1	48 (206)	46 (82)	66 (117)	80 (61)
	2	57 (162)	53 (101)	68 (87)	72 (116)
	3	58 (138)	55 (118)	70 (98)	87 (100)
	4	61 (181)	67 (75)	73 (142)	66 (65)
	5	70 (187)	62 (98)	69 (77)	72 (102)
	6	71 (154)	60 (110)	87 (108)	71 (94)
Weighted total		62 (N=1,884)	56 (N=1,015)	68 (N=1,625)	74 (N=987)

**Table 2**  
**Seat Belt Use of Teenage Front-Seat Passengers with Either Teenage or Adult Drivers Arriving at 12 High Schools in Connecticut and Massachusetts in the Morning and for Evening Football Games**

		Percent Use (N)			
		with Teenage Drivers		with Adult Drivers	
		Morning	Football	Morning	Football
Connecticut	1	24 (79)	46 (37)	41 (186)	60 (43)
	2	49 (55)	53 (64)	69 (93)	64 (121)
	3	49 (91)	51 (37)	52 (165)	63 (51)
	4	43 (54)	41 (41)	60 (197)	60 (70)
	5	51 (78)	29 (28)	52 (184)	43 (63)
	6	74 (69)	50 (36)	62 (157)	68 (91)
Massachusetts	1	39 (125)	44 (45)	43 (115)	39 (61)
	2	34 (105)	48 (65)	46 (87)	54 (115)
	3	35 (96)	44 (66)	37 (97)	63 (106)
	4	59 (111)	59 (51)	56 (139)	55 (66)
	5	59 (87)	63 (46)	59 (76)	71 (99)
	6	56 (90)	54 (68)	71 (107)	62 (93)
Weighted total		47 (N=1,040)	49 (N=584)	54 (N=1,603)	60 (N=979)

**Table 3**  
**Seat Belt Use of Teenage and Adult Drivers and Their Teenage Passengers, by Gender**

		Percent Use (N)			
		Morning		Football	
		Male	Female	Male	Female
Adult driver		63 (592)	71 (1032)	73 (472)	75 (510)
Teenage passenger with adult driver		50 (721)	56 (884)	52 (410)	64 (569)
Teenage driver		54 (993)	70 (890)	49 (628)	69 (389)
Teenage passenger with teenage driver		42 (494)	52 (544)	43 (301)	57 (286)

### **Variation by School and Gender**

Although not the focus of the study, it is clear from Tables 1-3 that belt use varied by school and by gender. For example, belt use among teenage drivers arriving at high schools in the morning ranged from 41 to 81 percent (Table 1). Some of the variation by school may be because of the relatively small numbers involved, but differences in socioeconomic status of the area in which the high school is located has explained some of the variation in belt use in prior studies at high schools. In the present study, median household income was related to adult driver belt use ( $r=0.58$ ,  $p=0.047$ ) but not to teenage driver use ( $r=0.24$ ,  $p=0.453$ ).

Table 3 indicates that, as is typical, seat belt use by females was higher than for males. This was so for teenage drivers, adult drivers, and teenage passengers, both at morning arrivals and at football games. The only comparison in Table 3 that was not statistically significant ( $p=0.05$ ) was between male (73 percent) and female (75 percent) adult drivers arriving at football games.

### **Teenage Drivers vs. Adult Drivers**

As Table 3 indicates, male teenage drivers had lower belt use than male adult drivers, both in the morning (54 vs. 63 percent,  $p<0.001$ ) and at football games (49 vs. 73 percent,  $p<0.001$ ). For female drivers, there was no difference in the morning between teenagers and adults (70 vs. 71 percent) and the difference at the football games was only marginally significant (69 vs. 75 percent,  $p=0.054$ ).

### **Teenage Passenger Belt Use with Teenage vs. Adult Drivers**

Teenage passengers in cars driven by other teenagers had lower belt use than teenagers in cars driven by adults. This was true particularly for males (morning: 42 vs. 50 percent,  $p=0.005$ ; football: 43 vs. 52 percent,  $p=0.012$ ) and to a lesser extent for females (morning: 52 vs. 56 percent,  $p=0.10$ ; football: 57 vs. 64 percent,  $p=0.029$ ).

### **Teenage Passenger vs. Teenage Driver Belt Use**

Table 3 also shows that teenage passengers with teenage drivers had lower belt use than teenage drivers regardless of driver gender. This was true for all comparisons: males/morning: 42 vs. 54 percent,  $p<0.001$ ; males/football: 43 vs. 49 percent,  $p=0.103$ ; females/morning: 52 vs. 70 percent,  $p<0.001$ ; females/football: 57 vs. 69 percent,  $p=0.001$ ). When only the cars containing teenage drivers and front seat teenage passengers were included (i.e., drivers with no passengers were excluded), teenage driver belt use in the morning was 61 percent vs. 47 percent for their teenage passengers ( $p<0.001$ ). At football games, 55 percent of the teenage drivers and 49 percent of the teenage passengers were belted ( $p=0.074$ ).

## Variation by Setting

There were some differences in belt use between the two settings in which observations were made. For males, teenage driver belt use was lower at football games (49 vs. 54 percent,  $p=0.023$ ), while adult driver usage was higher at games (73 vs. 63 percent,  $p=0.001$ ). For females, teenage passenger use was somewhat higher at football games, both with teenage drivers (57 vs. 52 percent,  $p=0.205$ ) and adult drivers (64 vs. 56 percent,  $p=0.002$ ).

Clearly there was some degree of individual variation in belt use in the two settings in which observations were made. Among the 122 teenage drivers assumed to have been observed in both settings (same sex, same license tag), 66 percent were consistent in their belt use, either using or not using on both occasions. Nineteen percent were belted in the morning but not at the football game; 16 percent were unbelted in the morning but belted at the game.

## Teenage Passenger Belt Use in Relation to Driver Use

Both male and female teenage passengers were much more likely to use belts if the driver was belted, whether the driver was another teenager or an adult. These relationships are shown in Table 4. For example, when arriving at high schools in the morning, 66 percent of male teenage passengers in the cars of teenage drivers were belted if the driver was, compared with 10 percent if the driver was unbelted. However, about a third of male passengers and 25-30 percent of female passengers were unbelted even when drivers were belted.

**Table 4**  
**Teenage Passenger Belt Use in Relation to Driver Belt Use**

	Percent Passenger Belt Use			
	Morning		Football	
	Male	Female	Male	Female
Teenage driver belt use				
Yes	66	71	67	78
No	10	20	16	26
Adult driver belt use				
Yes	64	68	66	74
No	22	30	23	34

Both male and female adult drivers had a similar influence on their teenage passengers. For example, in the morning observation, if adult male drivers were belted 67 percent of their teenage passengers were, compared with 28 percent if drivers were not belted. If female adult drivers were belted, 66 percent of their teenage passengers were, compared with 25 percent if the adult was not belted.

### **Unbelted Teenage Passengers with Adult Drivers**

Most adult drivers observed in this study are assumed to be parents, particularly when dropping off students in the morning. Although teenage passenger and adult belt use were highly correlated, it is revealing to see the frequency with which teenage passengers were unbelted when traveling in cars driven by adults presumed to be their mothers or fathers. For example, when dropping their children off at school in the morning, the overall use rate for adults was 68 percent compared with 54 percent for their children. Both were buckled on 46 percent of the morning trips, neither was buckled on 23 percent of the trips, the adults but not the teenage passengers were buckled in 23 percent of the occasions, and the teenage passengers but not the parents were buckled on the remaining 8 percent of the trips. Thus, when in cars driven by their presumed parents, 46 percent of teenage passengers in the front seat were unbelted. In 50 percent of these cases of unbelted teenage passengers, the adult drivers were belted.

### **Teenage Driver and Passenger Belt Use by Number of Vehicle Occupants**

There were no significant relationships between teenage driver belt use and the presence or number of teenage passengers either in the morning or at football games. For example, 64 percent of those driving alone in the morning were belted, compared with 60 percent when there was one teenage passenger, and 62 percent when there were two or more ( $p=0.439$ ). Nor was there a significant relationship between teenage passenger belt use and the presence of additional passengers when they were in cars driven by other teenagers. In the morning when there was only one teenage passenger 47 percent were using belts, compared with 49 percent when there were three occupants and 43 percent when there were four or more ( $p=0.648$ ).

## **DISCUSSION**

The study generally confirms earlier findings that teenagers in the front seats of vehicles have relatively low belt use. For drivers, however, low belt use relative to adults was limited to male teenagers, especially at football games. It was anticipated that teenage belt use might be lower in a more recreational setting although this was not generally the case. Male teenage driver belt use was lower at football game arrivals than when arriving for school in the morning, but female teenage passenger belt use was higher at football games. However, there were wider differences between teenage driver and adult driver belt use at the football games than in the morning, especially for male teenage drivers, but this was mostly because of an increase in male adult driver belt use at the games. It is possible that other recreational settings, e.g., leaving the football game or social settings more likely to involve alcohol use, would result in lower belt use. It is notable that belt use was inconsistent for one-third of the teenagers observed in both settings, i.e., they were belted on one occasion but not the other.

It was also anticipated that use rates in Connecticut would be higher than in Massachusetts, since Connecticut has a primary law and the reported statewide use rate in Connecticut (76 percent) is considerably higher than in Massachusetts (50 percent). There was considerable variation in both teenage and adult belt use within each state, but negligible differences in belt use overall between the two states. Belt use at high schools does not necessarily reflect statewide use, but the reasons for the lack of differences are unclear, particularly because the high schools were matched demographically. The statewide belt use figures include data from the highest socioeconomic area of the state, which were excluded from the high school study, and this may account for some of the discrepancy.

Teenage passenger belt use was low, particularly when with teenage drivers, in accordance with prior surveys. The presence of teenage drivers and teenage passengers together in a car elevates crash risk, and there is even greater crash risk when more than one teenage passenger is present. However, there was no evidence in this study of decreases in either teenage driver or teenage passenger belt use as occupancy of the vehicle increased. This is contrary to the findings of a study of belt use based on fatally injured teenage drivers and passengers (Williams and Shabanova, in press), but the finding that teenage driver belt use did not decrease as the number of teenage passengers increased is consistent with a prior observational study of teenage occupants (Womack et al., 1997). The reasons for this different result are unknown, but may reflect differences in characteristics of drivers and their passengers in fatal crashes compared with those not in crashes. In any case, the low belt use of teenagers, generally, is cause for concern.

The combination of high crash risk and low belt use among teenagers can be addressed both by measures to increase belt use and measures to reduce crashes. In terms of increasing seat belt use, changing from secondary to primary enforcement has been found to increase use rates (Solomon et al., 2000), although the effect on specific age groups has not been established and the lack of a relationship of belt use with primary-secondary status in the present study is curious. Another possibility is to build belt use requirements into graduated licensing systems. North Carolina has taken this approach, providing an incentive for belt use by not allowing advancement to the next licensing level if a seat belt violation has occurred within the previous six months, and imposing a higher fine than the general primary belt use law (up to \$100 vs. \$25). The problem can also be addressed by graduated licensing provisions that are designed to keep young beginners out of late-night and other high-crash-risk situations while they are learning. In particular, restrictions on carrying teenage passengers would address both the problems of high crash risk and low belt use. Interestingly, at the time of the study, Massachusetts had in place a restriction on transporting nonfamily members younger than age 18 for the first six months of licensure, unless a 21-year-old license holder was present. Presumably some of the Massachusetts drivers observed were under this restriction, but upon arrival at school 60 percent of the Massachusetts teenagers had a

teenage passenger in the car compared with 50 percent of Connecticut teenagers, and about equal percentages (57 percent in Connecticut, 59 percent in Massachusetts) had teenage passengers at football games.

Parents have primary responsibility for the safety for their children. Although teenage passenger use was higher when with an adult who was probably their parent, and teenage passenger and adult driver belt use were highly correlated, it is surprising how often teenagers were unbelted when they were traveling with their parents. Combining morning and evening observations, 44 percent of teenagers were not belted when with adult drivers, many of whom were themselves belted. Clearly many parents and other adults still need to be convinced of the importance of requiring teenagers to use seat belts whenever they travel in vehicles.

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