
Seatbelt Use, Attitudes, and Changes in Legislation

An International Study

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Background: The use of seat belts is among the most effective methods of reducing injury in motor vehicle crashes. We examined trends in seat belt use by university students from 13 European countries between 1990 and 2000, in relation to changes in legislation, attitudes, and hazardous driver behaviors.

Methods: Data were collected via an anonymous standardized questionnaire from university students in Belgium, England, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Poland, Portugal, and Spain. There were 10,576 respondents in 1990, and 10,294 in 2000. Data were also collected from 1672 students in the United States in 2000. Analyses were performed in early 2002.

Results: Reported seat belt use increased from 63% to 73% in male students, and from 66% to 77% in female students over the decade. There were marked increases in seat belt use in countries with changes in legislation or enforcement from 1990 to 2000, with 24% to 64% more respondents reporting seat belt use in 2000. The prevalence of use and noted changes during this period correlated with findings from national surveys ($r = 0.91$). Attitudes to seat belt use were associated with behavior both within and between countries. Nonuse of seat belts was positively related to alcohol-impaired driving and failure to obey speed limits.

Conclusions: Legislation has a substantial impact on the use of vehicle seat belts, but additional gains require efforts to change attitudes within the university student population.

Medical Subject Headings (MeSH): attitude, motor vehicles, public health, seat belts, students, wounds and injuries (Am J Prev Med 2002;23(4):254–259) © 2002 American Journal of Preventive Medicine

Introduction

Road traffic crashes result in widespread suffering and premature death throughout the world.¹ The use of seat belts is one of the most effective methods of reducing fatal and nonfatal injuries in motor vehicle crashes.^{2,3} Seat belt legislation is in place in much of the developed world, but seat belt use varies widely. Increasing seat belt use to 92% is a *Healthy People 2010*⁴ objective in the United States and a major priority in other countries as well.⁵

Analyses of trends in seatbelt use provide important information about progression to these goals. Interna-

tional surveys allow the consistency of determinants of protective behaviors to be assessed in diverse cultures and environments.⁶ This study compared seatbelt use in 1990 and again in 2000 in samples of university students drawn from 13 European countries representing Northwestern, Eastern European, and Mediterranean cultures. There is evidence that the introduction of seat belt laws and more stringent enforcement leads to increases in self-reported and observed use.² Between 1990 and 2000, new laws were introduced in three of the countries (Poland, Portugal, and Spain) included in this survey to make seat belt use mandatory on all road types for front-seat passengers. In addition, there was a significant increase in enforcement of seat belt laws in Greece, Hungary, and Ireland in the latter half of the 1990s, with more stringent surveillance and higher fines. We therefore hypothesized that changes in legislation would impact seatbelt use over and above any secular trends through time.

Attitudinal factors are important determinants of seatbelt use. Belief in the health benefits of seat belts and concern about complying with the law are associ-

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Table 1. The prevalence of always using a seat belt, 1990 and 2000^a

Country (<i>n</i>)	Men			Women		
	1990 % (95% CI)	2000 % (95% CI)	Change %	1990 % (95% CI)	2000 % (95% CI)	Change %
Belgium (1750)	77 (73–80)	69 (64–74)	–8	81 (78–84)	83 (78–88)	+2
England (1560)	88 (83–93)	83 (79–87)	–5	92 (88–96)	89 (85–93)	–3
France (1414)	88 (83–93)	88 (84–92)	0	88 (84–92)	95 (91–99)	+7
Germany (1518)	81 (77–85)	70 (66–75)	–11 ^b	89 (85–93)	83 (79–87)	–6
Greece (1462)	27 (22–32)	55 (51–59)	+28 ^b	28 (23–32)	60 (56–64)	+32 ^b
Hungary (1341)	64 (59–68)	74 (68–79)	+10 ^b	62 (58–67)	72 (68–77)	+10 ^b
Iceland (1476)	73 (69–77)	76 (72–81)	+3	85 (81–89)	92 (88–96)	+7
Ireland (1254)	75 (71–80)	85 (77–93)	+10	75 (72–79)	86 (81–90)	+11 ^b
Italy (2833)	46 (42–50)	53 (51–56)	+7 ^b	45 (41–49)	55 (52–57)	+10 ^b
Netherlands (1433)	83 (78–88)	83 (79–88)	0	92 (88–95)	89 (85–93)	–3
Poland (1554)	25 (20–29)	72 (68–77)	+47 ^b	24 (19–28)	81 (77–85)	+57 ^b
Portugal (1790)	31 (26–35)	92 (89–96)	+61 ^b	30 (26–34)	96 (92–99)	+66 ^b
Spain (1283)	55 (51–59)	81 (75–86)	+26 ^b	57 (53–61)	79 (74–84)	+22 ^b
USA (1672)		72 (68–75)			87 (84–89)	

^aPrevalence levels adjusted to the average age of the total population in the study.

^bNon-overlapping CIs.

CI, confidence interval.

ated with greater use, while discomfort, perceptions of low risk of injury, and belief that seat belts are not necessary for careful drivers are related to nonuse.^{7–9} We hypothesized that beliefs in the health benefits of seat belts would be positively associated with reported use, both within and between country samples. In addition, we assessed associations between wearing seat belts and two high risk driving behaviors—speeding and alcohol-impaired driving—since seat belt nonuse has been related to hazardous driving and other negative health behaviors in young adults.^{10,11}

This analysis used data collected from university students; thus, the samples were not representative of the countries involved. Since seatbelt use is associated with educational attainment^{7,12} and self-report overestimates actual use,¹³ the absolute rates are likely to be inflated. However, the main purpose was to assess changes over time and differences among country samples within the study; therefore, such comparisons are not invalidated by these factors. Nonetheless, comparisons between reported seat belt use and levels of use described in contemporary crossnational surveys were made to discover whether reported use was consistent with national statistics.

Methods

The data analyzed in this investigation were collected as part of the European Health and Behaviour Survey (EHBS), which was carried out from 1989 to 1991, and the International Health and Behaviour Survey (IHBS), which was conducted from 1999 to 2001. Both surveys involved university students aged 17 to 30 years studying non–health-related courses. The EHBS included 16,483 respondents (7302 men and 9181 women) from 21 European countries, while IHBS data were collected from 19,298 students (8482 men and 10,816 women) from 23 countries. Thirteen countries were included

in both surveys and formed the basis for these analyses. In addition, we provide data from U.S. students surveyed in 2000.

Data were collected during classes to ensure a high response rate (more than 90% in most countries). One university was sampled in each of ten countries, and two universities per country in the remainder. Preliminary analyses indicated no differences within countries, so country was the primary sampling unit. With minor variations, the same universities and student types were included in each survey. The target sample consisted of 400 men and 400 women in each survey, but the actual number varied depending on time constraints and the enthusiasm of collaborators. The total number of individuals included in analyses was 10,376 from the EHBS (1990) and 10,294 from the IHBS (2000), distributed to countries as shown in Table 1. The data were analyzed in early 2002.

Measures

Data were collected using self-completed anonymous questionnaires. A standard questionnaire and response format was developed in English and translated and back-translated into Dutch, Flemish, French, German, Greek, Hungarian, Icelandic, Italian, Polish, Portuguese, and Spanish. The reliability of the measures is described elsewhere.^{14,15} Seat belt use was assessed with the question: “When driving or riding in the front seat of a car, do you wear a seat belt?” Response options were “always, some of the time,” or “never.” The small number (374) of respondents who stated that they never rode in cars were excluded from the analyses. Individuals who were drivers (14,525 of the 20,297 respondents) were asked whether they drove within the speed limit (responding “all the time, most of the time, some of the time,” or “little of the time”), and whether they had driven after drinking too much within the last year. Attitudes were assessed with a ten-point rating of the importance to health of wearing a seat belt, where 1 = very low importance and 10 = very great importance.

Table 2. Belief in importance for health of using a seat belt, 1990 and 2000

Country	Men			Women		
	1990 % (95% CI)	2000 % (95% CI)	Change %	1990 % (95% CI)	2000 % (95% CI)	Change %
Belgium	8.3 (8.1–8.5)	7.5 (7.3–7.8)	−0.8 ^b	8.8 (8.6–8.9)	8.5 (8.3–8.7)	−0.3
England	8.8 (8.6–9.0)	8.3 (8.1–8.4)	−0.5 ^b	9.0 (8.8–9.2)	9.2 (8.9–9.4)	+0.2
France	8.7 (8.4–8.9)	8.8 (8.6–9.0)	+0.1	8.9 (8.7–9.1)	9.4 (9.1–9.6)	+0.5 ^b
Germany	8.8 (8.6–9.0)	8.3 (8.1–8.5)	−0.5 ^b	9.3 (9.1–9.5)	8.9 (8.7–9.1)	−0.4 ^b
Greece	7.6 (7.4–7.8)	8.3 (8.1–8.5)	+0.7 ^b	8.6 (8.3–8.8)	8.8 (8.6–9.0)	+0.2
Hungary	7.5 (7.3–7.7)	7.5 (7.3–7.8)	0	8.0 (7.8–8.2)	8.2 (8.0–8.4)	+0.2
Iceland	9.0 (8.8–9.2)	9.0 (8.8–9.2)	0	9.7 (9.5–9.9)	9.7 (9.4–9.9)	0
Ireland	8.8 (8.5–9.0)	8.8 (8.4–9.2)	0	9.3 (9.1–9.5)	9.4 (9.2–9.6)	+0.1
Italy	7.3 (7.1–7.5)	7.6 (7.5–7.8)	+0.3	7.7 (7.5–7.9)	8.4 (8.3–8.5)	+0.7 ^b
Netherlands	8.6 (8.4–8.9)	8.4 (8.2–8.6)	−0.2	9.1 (8.9–9.3)	8.8 (8.7–9.0)	−0.3
Poland	6.7 (6.5–6.9)	8.1 (7.9–8.3)	+1.4 ^b	7.2 (7.0–7.4)	8.8 (8.6–9.0)	+1.6 ^b
Portugal	7.4 (7.2–7.6)	8.5 (8.3–8.7)	+1.1 ^b	7.8 (7.6–8.0)	9.3 (9.1–9.5)	+1.5 ^b
Spain	8.3 (8.1–8.5)	8.9 (8.6–9.1)	+0.6 ^b	8.7 (8.5–8.8)	9.2 (9.0–9.5)	+0.50 ^b
USA		8.4 (8.2–8.6)			9.3 (9.2–9.4)	

Scores on ten-point scale adjusted to the average age of the total population in the study.

^bNon-overlapping CIs.

CI, confidence interval.

National Statistics

Data collected in the Social Attitudes to Road Traffic Risk in Europe (SARTRE) project in 1991 and 1996–1997 were compared with the present study's results from 1990 and 2000, respectively.⁹ All countries except Iceland were included in these comparisons.

Statistical Analysis

Data were analyzed using STATA 6.0 and SPSS.10.0.5. The proportion of individuals in 1990 and 2000 who stated that they always wore a seat belt is given as a percentage with 95% confidence intervals (CIs), adjusted for age. Belief in the health benefits of wearing a seat belt adjusted for age is presented as a mean with a 95% CI. Product-moment correlations between the age-adjusted prevalence of seat belt use and national statistics from the SARTRE project were computed, as were correlations between prevalence and average belief ratings in each country. Logistic regression was used to assess associations between strength of beliefs and seat belt use. Analyses relating seat belt use with hazardous driver behavior were aggregated across country samples. In these analyses, the clustered nature of the data was taken into account by including country as the primary sampling unit in STATA, with CIs adjusted accordingly.

Results

The prevalence of always wearing a seat belt in 1990 and 2000 is summarized in Table 1. There were small gender differences in both surveys, with more women than men using a seat belt in 1990 (66% vs 63%, respectively) and in 2000 (77% vs 73%, respectively). Seat belt use was greater than 80% in both men and women in 1990 in England, France, Germany, and the Netherlands, but below 60% in Greece, Italy, Poland, Portugal, and Spain. Between 1990 and 2000, striking

increases in seat belt use were reported in the samples from Greece, Poland, Portugal, and Spain, with more modest increases in Hungary, Ireland, and Italy. In 2000, reported seat belt use in Portugal and Spain equaled or exceeded that of northern European countries, but levels in Greece and Italy remained low. Male respondents from Germany and Belgium showed unexpected decreases. The level of seat belt use among U.S. male university students was lower than that reported in England, France, Ireland, the Netherlands, or Portugal, while levels among U.S. female university students were comparable with the highest rates reported in European samples.

Comparison with National Statistics

Reported seat belt use in 1990 (EHBS) was greater than that noted in the 1991 SARTRE surveys, while rates in 2000 (IHBS) were greater than those found in the 1996–1997 SARTRE surveys ($p < 0.002$). However, the correlation across countries between rates in this study and the national statistics were high; the 1990 data correlated $r = 0.92$ with 1991 national statistics, while the 2000 data correlated $r = 0.83$ with 1996–1997 national statistics (for both, $p < 0.001$). In addition, there was a strong correlation across countries between changes in prevalence of seat belt use between 1990 and 2000, and changes between the SARTRE 1991 and 1996–1997 surveys ($r = 0.91$, $p < 0.001$).

Attitudes Regarding Seat Belts and Reported Use

Belief in the importance to health of using a seat belt is summarized in Table 2. Ratings were toward the upper end of the ten-point scale, indicating relatively strong

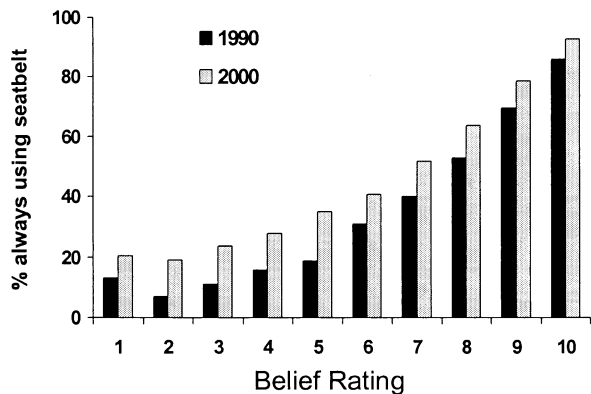


Figure 1. Proportion of respondents with belief scores at each level of the ten-point rating who report always using a seat belt.

beliefs in the value of seat belts. In 1990, beliefs were weaker in southern and eastern European country samples than in northwestern countries. However, there were significant increases in the strength of belief in men and women from Poland, Portugal and Spain, and in Greek men and Italian women. Ratings diminished in Germany in both genders, and in men from Belgium and England.

Between countries, mean belief ratings correlated with the prevalence of seat belt use, at $r = 0.87$ and 0.81 ($p < 0.001$) in men and women, respectively, in 1990; and $r = 0.56$ and 0.69 ($p < 0.05$) in 2000. Additionally, the change in mean belief between 1990 and 2000 correlated with the change in prevalence of seat belt use in men and women ($r = 0.93$ and 0.85 , respectively; $p < 0.001$). Thus, the changing pattern of seat belt use over time in the different country samples was strongly associated with average attitudes in each country to the health benefits of use.

Belief concerning the benefits of seat belt use was also consistently associated with behavior at an individual level. Figure 1 shows that the proportion of respondents always using a seat belt increased with the strength of belief in its importance to health. In the complete 1990 sample, respondents who wore seat belts

Table 3. Associations between beliefs and seat belt use

Country	Odds ratio of seat belt use for respondents with low versus high beliefs in the importance of seatbelts ^a	95% CI Confidence interval
Belgium	16.6	12.3–22.4
England	8.28	5.86–11.7
France	12.8	8.56–19.2
Germany	10.8	7.89–14.7
Greece	8.20	6.22–10.8
Hungary	11.3	8.29–15.4
Iceland	9.83	7.03–13.7
Ireland	9.41	6.84–13.0
Italy	6.67	5.63–7.91
Netherlands	22.4	13.6–36.9
Poland	10.9	8.16–14.4
Portugal	6.81	5.09–9.16
Spain	4.89	3.75–6.38
USA	17.0	12.5–23.2

^aLow belief is the reference category. Odds ratios adjusted for age, gender, and time (1990 or 2000), except for the USA (2000 only). CI, confidence interval.

had mean belief ratings of 9.2 (CI = 9.0–9.4), compared with 6.9 (6.5–7.3) in non-users. A similar pattern was observed in 2000, with beliefs averaging 9.2 (CI = 9.0–9.4) in users and 6.8 (CI = 6.4–7.2) in nonusers.

The association between attitudes and behavior was further investigated by logistic regression, with age, gender, year of survey, and beliefs as independent variables. The odds ratios (ORs) for seat belt use in individuals giving high ratings (9 or 10) were calculated, with lower ratings (1 to 8) as the reference category. Independently of age, gender, time of survey, and country of origin, the OR was 8.84 (CI = 8.29–9.49) in those with higher compared with lower belief ratings. The association was significant when each country was analyzed separately (Table 3).

Seat Belt Use and Hazardous Driving Behaviors

Consistent negative associations between seat belt use and speeding and alcohol-impaired driving were observed in both the 1990 and 2000 surveys (Table 4).

Table 4. Associations between seat belt utilization and other driver behaviors, 1990 and 2000^a

Driver behavior	1990		2000	
	Seat belt users % (95% CI)	Seat belt nonusers % (95% CI)	Seat belt users % (95% CI)	Seat belt nonusers % (95% CI)
Driving within speed limit always or most of the time	75 (70–78)	63 (58–69)*	75 (71–78)	56 (50–62)*
Alcohol-impaired driving at least once in past year	10 (8–13)	18 (14–23)*	11 (9–14)	21 (15–28)*

* $p < 0.001$.

^aData adjusted for age, gender, and clustering by country. CI, confidence interval.

Aggregating across genders and country samples, 12% more seat belt users than nonusers stated that they mostly drove within the speed limit, a difference that rose to 19% in 2000. Similarly, fewer seat belt users than nonusers reported alcohol-impaired driving. There is no indication from this study that the association between failure to use seat belts and hazardous driving behavior has diminished over the decade.

Discussion

The limitations of this study should be noted. The reported rates of seat belt use must be interpreted cautiously. Although self-reporting correlates with objective measures, utilization is typically overestimated by 9% to 19%.¹³ Only one or two universities in each country were sampled, so rates of use may not be representative of the general student population. Variations in the composition of samples in 1990 and 2000 may also have contributed to the pattern of results. As expected, reported prevalence of seat belt use was higher than that described in the SARTRE surveys.⁹ In the absence of national representative sampling, surveys of students are efficient methods to compare young individuals with similar characteristics from different countries and cultures in settings that permit high response rates.¹⁶ Students in different countries are the same age and have the same educational attainment, so international comparisons can therefore be cautiously made. In the student age group, motor vehicle crashes are the leading cause of death in men and women.¹⁷ Strong correlations were observed between reported seat belt use in this survey and levels described in national surveys. This indicates that while absolute levels of utilization among students may be high, the ranking of countries and trends over time are consistent with national data.

The results of these analyses are compatible with the notion that legislation has effects on seat belt use. Between the two surveys, new laws were introduced in Poland, Portugal, and Spain, and the result was an increase in reported use of seat belts from 56% to 80% in Spain, from 25% to 76% in Poland, and from 30% to 94% in Portugal. From being among the lowest reported users of seat belts in 1990, Portugal emerged as higher than all 12 other countries. In Greece, the changes in seat belt law enforcement were associated with an increase in use of 30%. In no other countries surveyed were gains of similar magnitude achieved.

The changes in behavior in Greece, Poland, Portugal, and Spain were associated with strengthened attitudes toward seat belt use. Studies of the impact of legislation on seat belts often ignore the attitudinal correlations of behavior.² We found a strong correlation ($r = 0.93$ for men and 0.85 for women) across countries between changes in reported behavior and changes in belief ratings over the decade. Although the

causal sequence cannot be determined, it seems probable that more positive attitudes emerged once the behavior was established through legislative change, and its benefits were found to outweigh barriers.

Important though legislation is, it is clearly not sufficient to maximize seat belt use. Levels of reported use remained at 60% or below in Greece and Italy despite legal requirements. Other samples showed a reduction in use (men in Belgium and Germany), while the reported use of seat belts among male university students in the United States was only 72%. One factor relevant to these patterns may be the role of primary versus secondary enforcement. Primary enforcement (i.e., when police officers are allowed to stop a vehicle solely for an observed seat belt law violation) has substantially greater effects on use than secondary enforcement (i.e., when a seatbelt law violation can only be cited after a vehicle has been stopped for another suspected misdemeanor).^{2,18} The recent U.S. Task Force on Community Prevention Services has strongly recommended the introduction of primary enforcement.¹ The impact of changes in enforcement was apparent in Hungary and Ireland, both of which showed increases of approximately 10% in seat belt use over the decade.

These results also illustrate the importance of attitudes to seat belt use at an individual level. Although belief in the health benefits of seat belts was relatively strong among young nonusers (averaging 6.9 and 6.8 in 1990 and 2000, respectively), it was nevertheless significantly below the levels observed among users (mean 9.2). There was an orderly association between the strength of belief and the likelihood of wearing a seat belt, with high rates of use among individuals with belief ratings of 10 (Figure 1). Regression analyses indicated that belief ratings were consistently associated with utilization in different cultures with widely varying base rates (Table 3). Belief in the health benefits of an action are central to models of health behavior, such as health belief models and the theory of planned behavior.¹⁹ Manipulation of attitudes in experimental studies has been shown to influence intentions to wear seat belts.²⁰ It is striking that the mean belief ratings of nonusers were the same in 2000 as they were in 1990, indicating that nonusers throughout the decade remained equally skeptical about the benefits of seat belt use. These results suggest that efforts to modify attitudes may be central to further increases in seat belt use by drivers and passengers.

Reliable associations were observed between seat belt use and hazardous driving behaviors (Table 4). Individuals who stated that they always wore seat belts were more likely to obey speed limits and less likely to drink and drive than were nonusers. This pattern was observed in the complete survey and in the country samples analyzed separately (data not shown). One of the justifications offered by people who do not wear

seat belts is that they are unnecessary for careful drivers.⁹ The present results suggest this argument is a rationalization, since not using a seat belt is evidently a preference of hazardous rather than safe drivers.

The results of this survey endorse the effectiveness of legislation in stimulating greater seat belt use. Both the laws requiring seat belt use and the way they are enforced are associated with use, and substantial changes in reported use appear to result from alterations in the legislative approach. However, the findings also suggest that further increases in use require attention to attitudinal factors and to methods of enhancing belief in the benefits to health of seat belts for drivers and passengers.

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