

A Summary of Research Concerning the Effectiveness of Rear-Seat Restraint Use

Submitted to:
John LeBlanc
Executive Director
Louisiana Highway Safety Commission

By:
Dr. Helmut Schneider
Ourso Family Distinguished Professor
and Chairman of Information Systems and Decision Sciences at
Louisiana State University
Ph.: 225-578-2516
Fax: 225-578-2511
Homepage: <http://isds.bus.lsu.edu>
LA Traffic Crash Reports <http://lhsc.lsu.edu>

Overview

Seat belts work as restraints for vehicle occupants both by keeping them securely in their cars during a crash and by decreasing the impact of a crash. A seat belt applies the stopping force to more durable parts of the body as well over a longer period of time. There are three distinct forces an occupant experiences in a crash: "The first is the force of the vehicle colliding with another object. The second is the force of the occupant's body colliding with the interior of the vehicle. The third is the force of the occupant's body organs colliding against the body's skeletal structure. A seat belt functions to stop the occupant with the car, preventing the body from continuing to travel at the car's original speed after the car has stopped." Aggregates Manager, (2007)

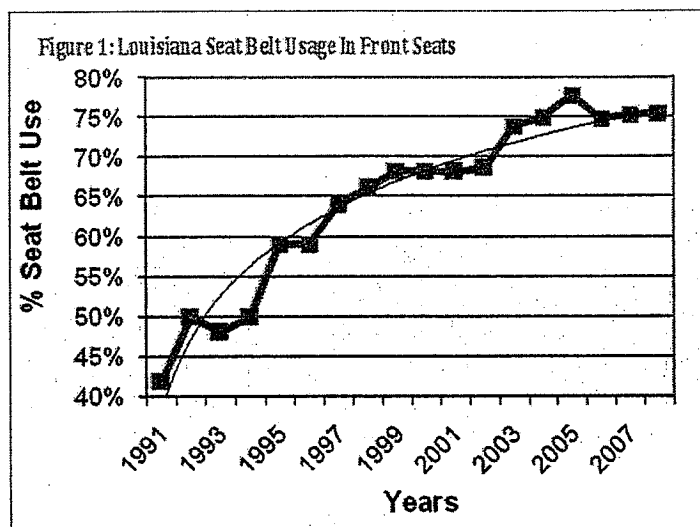
Research has repeatedly demonstrated what is now widely known: seat belts save lives and prevent injuries. Several independent studies have shown that seat belts also reduce the severity of injuries: the odds of serious injuries for people not wearing seat belts are 4 to 5 times greater than for people who are belted. For instance, according to NHTSA, seat belts reduce a person's chances of dying in a crash by 45% and of being injured by 50%. For light-truck occupants, seat belts reduce the risk of fatal injuries by 60% and moderate to critical injuries by 65%. Seat belts also prevent total ejections from a car during a crash, an important factor in preventing fatalities since 76% of car occupants who are totally ejected during a crash are killed according to NHTSA (Traffic Safety Facts, 2007).

Safety belts are the most effective means of reducing deaths and serious injuries in traffic crashes. Based on data compiled by NHTSA, in 2007 there were 28,933 occupants of passenger vehicles killed in traffic crashes in the United States. For 92% of these fatalities seat belt usage was known and of those, 54% were unrestrained. Ejection from the vehicle is one of the most harmful events that can happen to a person in a crash. Seventy-six percent of passenger vehicle occupants who were totally ejected from their vehicle were killed in fatal crashes in 2007. Only 1% of the occupants reported to have been using restraints were totally ejected compared with 31% of unrestrained occupants (NHTSA, 2007).

Seat belts also reduce the costs associated with motor vehicle crashes. Because seat belts lessen the severity of injuries during a crash, the average medical costs associated with the injury of an unbelted driver is over 60% greater than the costs of a belted driver. The

Highway Safety Research Group at LSU estimates that the costs associated with fatalities and injuries from not wearing a seat belt was \$0.95 billion or about \$333 for every licensed driver in 2007, in Louisiana.

Statistics published by the National Highway Traffic Safety Administration (NHTSA 2008) show that on the average 82% of front seat vehicle occupants in the nation use seat belts; however, in Louisiana, only 75% of front seat occupants wore seat belts in 2008 and 76% ("84% nationwide) of all passenger car occupants were buckling up in the front seats in 2008. A greater percentage of people in Louisiana, 79% (86% nationwide), are buckling up in vans and



SUVs than in pickup trucks, where only 72% (74% nationwide) of occupants were buckling up in the front seats in 2008. Although Louisiana drivers are buckling up more frequently than they were ten years ago, seat belt usage still falls far behind seat belt usage in other states. For instance, since 1991, seat belt usage in front seats increased from 43% to 75%, but

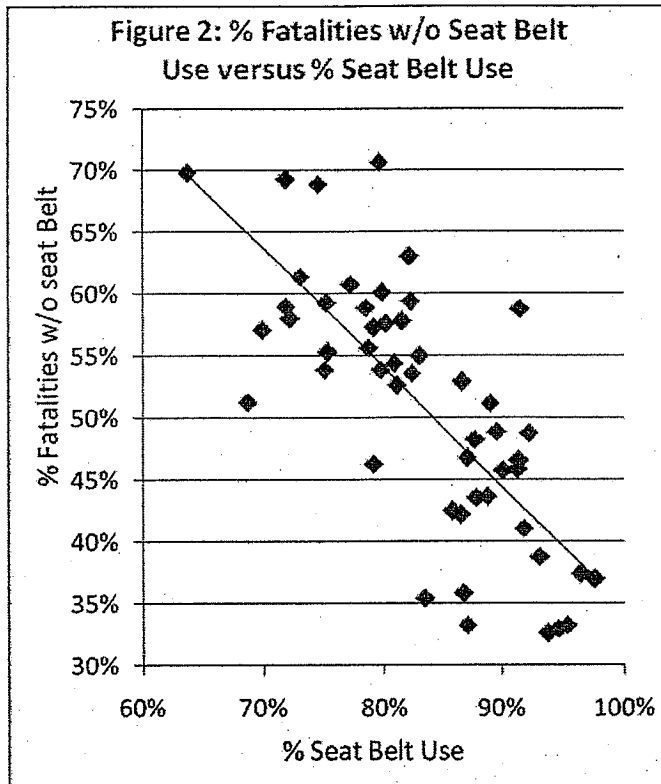
this percentage is considerably below the national average of 82%. Moreover, the 25% of occupants not wearing seat belts made up 65% of all Louisiana fatalities in motor vehicles in 2007 and 64% of all fatalities in motor vehicles in 2008. The 65% overall average of fatalities for Louisiana far exceeds the national average of 54%.

Table 1: Louisiana Seat-Belt Use in Fatal Crashes

Year	Safety Belt Usage of All Front-Seat Occupants	Percent of Drivers Killed not Wearing Safety Belts	Percent of Passengers, Ages 5 and Older, Killed not Wearing Safety Belts	Percent of All Occupants Killed not Wearing Safety Belts
2002	69%	64%	69%	65%
2003	74%	64%	71%	65%
2004	75%	59%	69%	62%
2005	78%	60%	60%	60%
2006	75%	62%	63%	62%
2007	75%	63%	68%	65%

2008	75%	62%	68%	64%
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A NHTSA report finds that safety belt use increased or remained level in every region of the country; the highest usage reported was in the West (93 percent), and the lowest was in the



Midwest and Northeast (79 percent). The South reported 81 percent. The report also indicated that the states with primary seat belt laws averaged 13 percentage points higher for seat belt use than states with secondary laws (NHTSA, 2008). There is a strong correlation between seat belt use and the fatality rates. States with higher seat belt usage have a much lower percentage of fatalities without seat belts than states with a lower percentage of seat belt use as Figure 2 shows. For instance, California had an observed seat belt use of 95% in 2007 with 36% of fatalities without seat belt use and the fatality rate per 100,000 licensed drivers was 1693. In 2007 Louisiana had an observed seat belt

use of 75% with 65% of fatal occupants had not buckled up and the fatality rate was almost twice that of California, namely of 3247 fatalities per 100,000 licensed drivers. Although seat belts don't prevent every death in a motor vehicle crash, they will reduce the number of death significantly. NHTSA estimates that 15,147 lives were saved in 2007 with the use of seat belts. An additional 5,024 lives could have been saved in 2007 if all unrestrained motor vehicle occupants involved in fatal crashes had worn their seat belts.

Although the seat belt usage rates have improved, the United States still falls behind other industrialized nations such as Great Britain, Germany, Sweden, Australia, and Canada, where seat belt usage exceeds 90%. As a consequence, these countries have lower traffic fatality rates.

Research on Seat Belt Usage in Back Seats

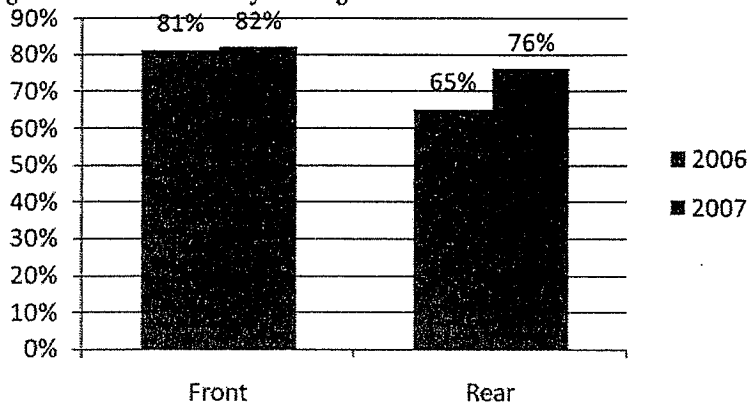
Despite the overwhelming evidence that seat belts save lives, the Louisiana law does not require seat belt usage for occupants in the back seats of motor vehicles for people ages 13 and above. Most people are unaware that seat belts not only save the lives of the occupant who is buckled up, but they also prevent him/her from becoming a danger to other occupants in the car. In a scientific study, Cummings and Rivara (2004) found conclusive evidence that there was a correlation between fatalities occurring in traffic crashes and seat belt usage of the occupants in the back seat. The main conclusions of the study were that the risk of death for front-seat occupants increases when the back-seat occupants are not buckled up. This is because the unrestrained passenger becomes a projectile in the case of a crash.

A similar study, conducted by Ichikawa, Nakahara & Wakai (2002), also focused on the risk of death and severe injury for front-seat occupants in car crashes involving unbelted rear-seat passengers. Their study showed that the risk of death for drivers and front-seat passengers increased about five-fold when rear-seat occupants were unrestrained. The authors estimate that the number of deaths could have been reduced by 79.2%.

Zhuo Motao conducted a study on the effectiveness of rear seat safety belt use. Motao's research was based on vehicles from the national Fatality Analysis Reporting System during the years 2000-2004. Cases for occupants 16 years and older were used in which the driver or at least one rear seat passenger aged 16 years or older was killed. The results showed that their seat belt use was effective in reducing fatalities. The effectiveness of seat belts was estimated to be 61% for the left rear seated occupants, 71% for the center rear seated occupants and 56% for the right rear seated occupants in passenger cars. For light trucks, vans and utility vehicles, the safety belt effectiveness was 71%, 66% and 78%, respectively. Rear seat safety belts were significantly more effective when the vehicle rolled over or when the passenger was younger than 65-years-old.

Seat belt use in rear seats in the United States was 76% in 2007, 11 percentage points higher than in 2006. This result is taken from the National Occupant Protection Use Survey (NOPUS), which provides the only probability-based observed data on seat belt usage in the United States. NOPUS is conducted annually by the National Center for Statistics and Analysis of NHTSA (April, 2008). The survey observes usage as it actually occurs at random selection

Figure 3: Seat-Belt Use by Seating Position in the USA



roadway sites. As Figure 3 indicates, seat belt use continued to be lower in the rear seat than in the front seat.

Seat belt surveys commissioned by the Louisiana Highway Safety Commission did not include seat belt use in back seats until 2008. The 2008 survey of safety belt usage in Louisiana shows that,

on the average, less than one out of three passengers in the rear seat wears safety belts. The safety belt use in the back seat of extended pickup trucks is even less than 10% in some regions.

It is safe to predict that in 2007 at least 22 lives could have been saved by preventing these rear seat occupants from being ejected.

Table 2: Rear-Seat Safety Belt Survey: 2008

Region	Back-Seat Safety Belt Usage Survey results				
	%AUTO	%PKUP*	%SUV	%VAN	%Total
1 (NO)	22.5%	8.2%	25.9%	24.5%	21.6%
2 (EBR)	21.0%	6.9%	35.0%	25.7%	23.2%
3 (Houma)	43.1%	20.0%	45.4%	43.1%	38.3%
4 (Lafayette)	41.8%	17.0%	41.6%	50.3%	37.9%
5 (Lake Charles)	33.7%	21.6%	44.0%	38.1%	37.9%
6 (Alexandria)	30.1%	8.8%	25.3%	9.2%	29.9%
7 (Shreveport)	21.9%	10.2%	14.2%	25.7%	20.4%
8 (Monroe)	11.9%	17.4%	24.0%	14.2%	17.7%
Louisiana	27.3%	12.5%	31.3%	29.4%	27.2%

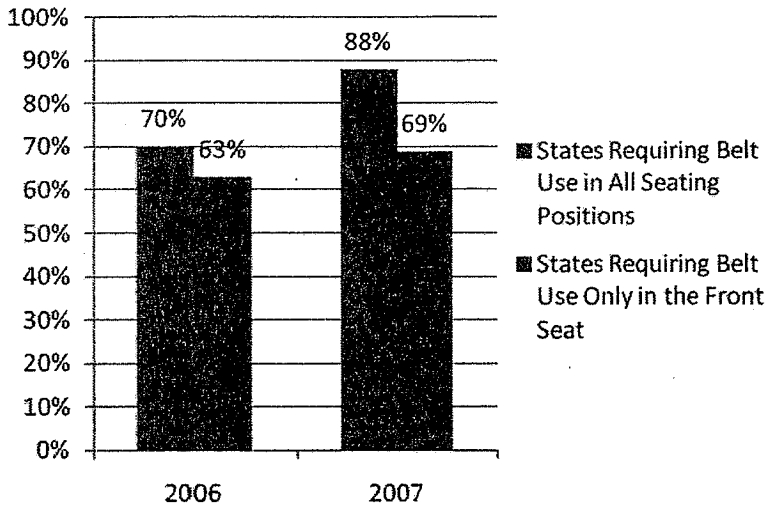
* Extended multi-seat pickup trucks

The analysis of the Louisiana crash data shows that in 2008, 55 occupants, ages 12 years and older, were killed while riding in the back seat of a vehicle. Of the 55 killed occupants, 33 were not wearing seat belts. In 2007, 58 occupants in back seats were killed, 42 of which

were not wearing a seat belt. Many of these deaths could have been avoided if the occupants had used a seat belt.

Surveys show that seat belt usage in back seats is significantly higher in states that have laws requiring that all back seat occupants be buckled up of which there are currently 18 states

Figure 4: Seat-Belt Use in Rear Seats by Year and Law Type in 2006 and 2007



and the District of Columbia with laws requiring that seat belts be used in all seating positions. All states, with the exception of New Hampshire, have mandatory seat belt laws. Seat belt use in rear seats was highest among states with laws requiring seat belt use in all seating positions. While the observed seat belt usage in states that require seat belt use in all seats is only slightly higher (84% versus 83%) than in states that require only seat belt use in front

seats, the percentage of fatalities without seat belt is 6.6 percentage points higher (56% versus 49.4%) in the latter states.

In 23 of these states, the law specifies secondary enforcement which only allows citations for seat belt usage to be written if the vehicle is stopped for some other violation. Twenty six states have laws that allow primary enforcement which allows officers to write citations for violating the seat belt law without any other traffic violation. In most states, these laws cover front-seat occupants only, although seat belt laws in 19 states include all rear seat occupants as well. (Insurance Institute for Highway Safety, 2009).

Table 3: Seat Belt Laws by State

Top of Form	Initial effective date	Standard enforcement?	Who is covered? In what seats?	Maximum fine 1st offense	Can nonuse decrease monetary awards for injuries in lawsuits?	Seat Belt in All Seats	2007 Reported Seat Belt Use	2007 Percent Fatalities without Seat Belt
Alabama	7/18/1991	yes; effective 12/09/99	15+ years in front seat	\$25	no	No	82%	62%
Alaska	9/12/1990	yes; effective 05/01/06	16+ years in all seats	\$15	yes	No	82%	54%
Arizona	1/1/1991	no	5+ years in front seat; 5 through 15 in all seats	\$10	yes	No	81%	62%
Arkansas	7/15/1991	no	15+ years in front seat	\$25	no	No	70%	63%
California	1/1/1986	yes; effective 01/01/93	16+ years in all seats	\$20	yes	Yes	95%	36%
Colorado	7/1/1987	no	16+ years in front seat	\$15	yes	No	81%	55%
Connecticut	1/1/1986	yes	7+ years in front seat	\$15	no	No	86%	48%
Delaware	1/1/1992	yes; effective 06/30/03	16+ years in all seats	\$25	no	Yes	87%	45%
District of Columbia	12/12/1985	yes; effective 10/01/97	16+ years in all seats	\$25	no	Yes	87%	47%
Florida	7/1/1986	no (yes for children <18; effective 07/01/05)	6+ years in front seat; 6 through 17 years in all seats	\$30	yes	No	79%	59%
Georgia	9/1/1988	yes; effective 07/01/96	6 through 17 years in all seats; 18+ years in front seat	\$15	no	No	89%	57%
Hawaii	12/16/1985	yes	8 through 17 years in all seats; 18+ years in front seat	\$45	no	No	98%	40%

Table 3: Seat Belt Laws by State (continued)

Top of Form	Initial effective date	Standard enforcement?	Who is covered? In what seats?	Maximum fine 1st offense	Can nonuse decrease monetary awards for injuries in lawsuits?	Seat Belt in All Seats	2007 Reported Seat Belt Use	2007 Percent Fatalities without Seat Belt
Idaho	7/1/1986	no	7+ years in all seats	\$10	no	Yes	79%	61%
Illinois	1/1/1988	yes; effective 07/03/03	16+ in front seat; 18 and younger in all seats if driver is younger than 18 years	\$25	no	No	90%	52%
Indiana	7/1/1987	yes; effective 07/01/98	16+ years in all seats	\$25	no	Yes	88%	50%
Iowa	7/1/1986	yes	11+ years in front seat	\$25	yes	No	91%	50%
Kansas	7/1/1986	no (yes for children <18; effective 07/01/07)	14 through 17 in all seats; 18+ in front seat	\$30	no	No	75%	58%
Kentucky	7/15/1994	yes; effective 07/20/06	6 and younger and more than 50 inches in all seats; 7+ in all seats	\$25	no	Yes	72%	59%
Louisiana	7/1/1986	yes; effective 09/01/95	13+ years in front seat	\$25	no	No	75%	65%
Maine	12/26/1995	yes; effective 09/20/07 (warning only until 04/01/08)	18+ years in all seats	\$50	no	No	80%	57%
Maryland	7/1/1986	yes; effective 10/01/97	16+ years in front seat	\$25	no	No	93%	42%
Massachusetts	2/1/1994	no	13+ years in all seats	\$25	no	Yes	69%	65%
Michigan	7/1/1985	yes; effective 04/01/00	16+ years in front seat	\$25	yes	No	94%	37%

Table 3: Seat Belt Laws by State (continued)

Top of Form	Initial effective date	Standard enforcement?	Who is covered? In what seats?	Maximum fine 1st offense	Can nonuse decrease monetary awards for injuries in lawsuits?	Seat Belt in All Seats	2007 Reported Seat Belt Use	2007 Percent Fatalities without Seat Belts
Minnesota	8/1/1986	no	all in front seat; 3 through 10 years in all seats	\$25	no	No	88%	53%
Mississippi	7/1/1994	yes; effective 05/27/06	7+ years in front seat	\$25	no	No	72%	69%
Missouri	9/28/1985	no (yes for children <16)	16+ years in front seat	\$10	yes	No	77%	65%
Montana	10/1/1987	no	6+ years in all seats	\$20	no	Yes	80%	71%
Nebraska	1/1/1993	no	18+ years in front seat	\$25	yes	No	79%	65%
Nevada	7/1/1987	no	6+ years in all seats	\$25	no	Yes	92%	52%
New Hampshire	n/a	no law	no law	no law	no	No	64%	70%
New Jersey	3/1/1985	yes; effective 05/01/00	7 years and younger and more than 80 pounds; 8 through 17 in all seats; 18+ in front seat	\$20	yes	No	91%	48%
New Mexico	1/1/1986	yes	18+ years in all seats	\$25	no	Yes	92%	60%
New York	12/1/1984	yes	16+ years in front seat	\$50	yes	No	84%	40%
North Carolina	10/1/1985	yes (secondary for rear seat occupants)	16+ years in all seats	\$25	no	Yes	89%	48%

Table 3: Seat belt Laws by State (continued)

Top of Form	Initial effective date	Standard enforcement?	Who is covered? In what seats?	Maximum fine 1st offense	Can nonuse decrease monetary awards for injuries in lawsuits?	Seat Belt in All Seats	2007 Reported Seat Belt Use	2007 Percent Fatalities without Seat Belts
North Dakota	7/14/1994	no	18+ years in front seat	\$20	yes	No	82%	68%
Ohio	5/6/1986	no	8 through 14 in all seats; 15+ years in front seat (effective 10/07/09)	\$30 driver/\$20 passenger	yes	No	82%	59%
Oklahoma	2/1/1987	yes; effective 11/01/97	13+ years in front seat	\$20	no	No	83%	59%
Oregon	12/7/1990	yes	16+ years in all seats	\$90	yes	Yes	95%	39%
Pennsylvania	11/23/1987	no	8 through 17 years in all seats; 18+ years in front seat	\$10	no	No	87%	62%
Rhode Island	6/18/1991	no (yes for children <18)	18+ years in all seats	\$75	no	Yes	79%	58%
South Carolina	7/1/1989	yes; 12/9/05	6+ years in front seat; 6+ years in rear seat with shoulder belt	\$25	no	Yes	73%	67%
South Dakota	1/1/1995	no	18+ years in front seat	\$20	no	No	75%	75%
Tennessee	4/21/1986	yes; 07/01/04	16+ years in front seat	\$50	no	No	80%	61%

Table 3: Seat belt Laws by State (continued)

Top of Form	Initial effective date	Standard enforcement?	Who is covered? In what seats?	Maximum fine 1st offense	Can nonuse decrease monetary awards for injuries in lawsuits?	Seat Belt in All Seats	2007 Reported Seat Belt Use	2007 Percent Fatalities without Seat Belts
Texas	9/1/1985	yes	4 and younger and 36 in or more; 5 through 16 years in all seats; 17+ years in front seat	\$200	no	No	92%	44%
Utah	4/28/1986	no (yes for children <19 years)	16+ years in all seats	\$45	no	Yes	87%	43%
Vermont	1/1/1994	no	16+ years in all seats	\$25	no	Yes	87%	48%
Virginia	1/1/1988	no	16+ years in front seat	\$25	no	No	80%	63%
Washington	6/11/1986	yes; 07/01/02	16+ years in all seats	\$124	no	Yes	96%	41%
West Virginia	9/1/1993	no	8+ years in front seat; 8 through 17 years in all seats	\$25	yes	No	90%	58%
Wisconsin	12/1/1987	no	8+ years in all seats	\$10	yes	Yes	75%	60%
Wyoming	6/8/1989	no	9+ years in all seats	\$25 driver/\$10 passenger	no Bottom of Form	Yes	72%	59%

¹Arkansas rewards belt use by reducing the fine for the primary violation by \$10.

²New Mexico and District of Columbia assesses points for violations.

³In Georgia, the maximum fine is \$25 if the child is 6-18 years old.

⁴Drivers in Massachusetts may be fined \$25 for violating the belt law themselves and \$25 for each unrestrained passenger 12-16 years of age.

⁵New York only assesses points when the violation involves a child under 16.

⁶Police are prohibited in South Carolina from enforcing safety belt laws at checkpoints designed for that purpose. However, safety belt violations may be issued at license and registration checkpoints to drivers cited for other offenses.

⁷Drivers 18 and older in Tennessee who choose not to contest the citation pay a \$10 fine by mail; the fine is \$20 for drivers who are 16 and 17 years old.

⁸Wyoming rewards belt use by reducing the fine for the primary violation by \$10.

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