



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



DOT HS 810 746

March 2007

Estimated Minimum Savings to the Medicaid Budget in Colorado by Implementing a Primary Seat Belt Law

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

1. Report No. DOT HS 810 746	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Estimated Minimum Savings to the Medicaid Budget in Colorado by Implementing a Primary Seat Belt Law		5. Report Date March 2007	
		6. Performing Organization Code	
7. Author(s) Julie Tison, Neil Chaudhary		8. Performing Organization Report No.	
9. Performing Organization Name and Address Preusser Research Group, Inc. 7100 Main Street Trumbull, CT 06611		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTNH22-05-D-15043 Task Order No. 008	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street SW. Washington, DC 20590		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract A 2003 study estimated that if all States had primary seat belt laws from 1995 to 2002, over 12,000 lives would have been saved. Failure to implement a primary seat belt law creates a real cost to a State's budget for Medicaid and other State medical expenditures. This study estimates the minimum dollars Colorado can expect to save on direct medical costs (primarily paid through Medicaid) by the implementation of a primary seat belt law. The current study analyzed Colorado's 2005 Hospital Discharge Data, including only cases where the external cause of injury was a motor vehicle crash. The total estimated costs to Medicaid, including Traumatic Brain Injury and Spinal Cord Injury costs, from motor vehicle crashes for the first year the injury was incurred for Colorado is \$58.7 million for the first year and \$7.7 million for each year after.. In 2006, Colorado's seat belt use rate was 80.3%. Based on a 40 percent expected conversion rate, one would expect belt use to increase by 7.88%, and of those newly belted individuals at least 50% would avoid injury (based on seat belt effectiveness in reducing injury). However, the Federal Government reimburses States a portion of their Medicaid expenditures. The reimbursement rate for Colorado is 50.0%. Accounting for this reimbursement, the first-year savings to the State by implementation of a primary seat belt law would be about \$1.2 million dollars. Colorado could expect to have saved \$7.3 million in the first 5 years and \$18.2million over 10 years.			
22. Key Words Seat belt Enforcement		18. Distribution Statement	
19. Security Classif.(of this report) Unclassified	20. Security Classif.(of this page) Unclassified	21. No. of Pages	22. Price

INTRODUCTION

On Saturday, January 8, 2005, at 11:13 a.m., a 33-year-old man was driving on an urban road in Fort Collins, Colorado – he was unbelted. He crashed into a vehicle driven by an 86-year-old woman who was wearing a seat belt. The 33-year-old man died; the elderly woman wearing her seat belt survived with no visible injuries.

On Wednesday, April 20, 2005, at 7:22 p.m., a 30-year-old woman was driving on SR-86 in Douglas County, Colorado, when she was involved in a collision. The other vehicle was driven by a 51-year-old man. The 51-year-old male driver and his two passengers (a 51-year-old woman and a 43-year-old man), all belted, survived. The crash killed the 30-year-old woman, who was not wearing a seat belt.

On Monday, August 8, 2005, at 7:50 p.m., two vehicles were traveling on a rural road in Weld County, Colorado. The driver of the first vehicle, a 48-year-old male driver, unbelted, died. The driver of the other vehicle, a 17-year-old man, and his 14-year-old male passenger, both properly restrained, survived.

On Wednesday, October 19, 2005, at 10:31 p.m., two vehicles were involved in a crash on US-6 in Denver, Colorado. The driver of one vehicle, an unbelted 33-year-old woman, was killed. The other vehicle's driver, a 28-year-old man wearing his belt, was uninjured.

Seat belts can reduce the risk of death for front-seat occupants of passenger cars by 45%. Similarly, belt use reduces the risk of serious non-fatal injuries by 50% for front seat occupants of passenger cars. Belts are associated with a 60-percent decreased risk of injury while in light trucks (e.g., SUVs, minivans, and pickup trucks).¹

There are two types of belt laws. Primary or “standard enforcement” seat belt laws allow a police officer to enforce a violation of a seat belt law after observing a belt use infraction by itself. That is, the police can treat seat belt violations as they would any other violations. Secondary laws prevent police from enforcing the belt law unless they observe another violation. That is, if the belt violation is the only visible infraction; police are not allowed to enforce the law.

According to the National Highway Traffic Safety Administration, the passage of primary seat belt laws would likely induce 40% of current nonusers to wear seat belts. One study by the National Safety Council estimated that had all States had primary laws from 1995 to 2002 more than 12,000 lives would have been saved.²

Additionally, there is a real cost to the State's budget in terms of Medicaid and other State medical expenditures associated with failure to implement a primary seat belt law. Specifically, this study estimates the *minimum* dollars Colorado could expect to save on direct medical costs (primarily paid through Medicaid) by the implementation of a primary seat belt law.

METHODS

This analysis used Colorado's 2005 Hospital Discharge Data. Only cases where the external cause of injury was a motor vehicle crash were included. There were 4,639 such patients discharged from Colorado hospitals in 2005. The cost of these motor-vehicle-generated injuries was \$261,378,642 in direct hospital costs alone. Of that, Colorado paid \$37,735,909 to Medicaid and other sources.

Of the 4,639 patients discharged, 1,120 injuries were classified as Traumatic Brain Injuries (TBI) and/or Spinal Cord Injuries (SCI). These particular injuries are likely to lead to long-term post-hospitalization medical costs, that is, the costs continue over an injured person's lifetime. These costs cannot be looked at over a single year but need to be accumulated annually to gain an understanding of their financial impact to the State. Injuries occurring this year will cost taxpayers money next year on top of the injuries occurring next year. In three years time, the costs will be for both the prior two years' injuries plus that year's injuries.

Traumatic Brain Injury Cost Estimates

The long-term direct medical costs for various types of injuries differ greatly. None of our estimates includes peripheral costs such as lost wages and productivity. Post-hospitalization TBI costs per person are estimated at \$40,000 for rehab and other medical costs during the first year, according to the Craig Hospital.³ Additional year costs were estimated from the National Institute of Health values pertaining to traumatic brain injuries, lifetime costs for such injuries and average lifespan of people with TBI. The average direct medical cost (beyond the first year) was estimated to be \$26,871 per person per year in addition to initial direct hospital costs. Having a TBI lessens life expectancy by an average of 7 years.⁴

Spinal Cord Injury Cost Estimates

SCI costs were based on the University of Alabama's National Spinal Cord Injury Statistical Center report showing first-year cost per injury severity and additional year costs per injury severity. These costs were matched using ICD-9 codes to the injured people in the Colorado Hospital Discharge Database to estimate the costs for spinal-cord-injured individuals (see Table 1 for post-discharge costs). Note that the costs indicated in Table 1 are *per injury*. It is only in a minority of cases that life expectancy is less than 10 years for SCI survivors; in fact, 85% of SCI patients who survive the first 24 hours are still alive 10 years later.^{5 6}

Table 1: Average Yearly Expenses

Injury Severity	First year	Each year thereafter
High quadriplegia	\$ 741,425	\$ 132,807
Low quadriplegia	\$ 478,782	\$ 54,400
Paraplegia	\$ 270,913	\$ 27,568
Incomplete motor function at any level	\$ 218,504	\$ 15,313

Source: The National SCI Statistical Center⁵

Medicaid Estimates

Estimating the percentage of TBI and SCI patients who are likely to become Medicaid recipients is difficult. The Craig Hospital showed that the proportion of those with TBI on Medicaid doubles in the year following injury. For SCI, one estimate is that there is a 24% increase in Medicaid-covered patients from the time of injury to the time of release from the hospital. That is, according to the Missouri Model Spinal Cord Injury Center,⁷ 25% of SCI patients were covered by Medicaid at the time of injury and this figure increased to 31% upon release from the acute care facility (for SCI, the average length of stay in the acute care unit is 18 days⁵). Furthermore, the Craig Hospital estimates that 25.4% of all SCI will become Medicaid patients. Specifically, this was the percentage of SCI people on Medicaid 5 years after injury.

RESULTS

In 2005, there were 104 TBI patients on Medicaid discharged from Colorado hospitals. Six of these patients died from their injuries and only contributed to acute hospital care costs. The actual hospital charges were \$9,216,295. In addition, the 98 surviving TBI patients each generated an estimated \$40,000 first-year health care costs. Furthermore, there is expected to be another \$26,871 per person for each additional year post-injury. Thus, the cost to Medicaid for the first year is estimated at about \$13.1 million with each additional year (assuming the percentage on Medicaid doubles as per the Craig Hospital) adding about \$5.3 million (see Table 2).

In 2005 there were 105 patients with SCI stemming from motor vehicle crashes, 21 of whom were on Medicaid. Four of these patients died of their injuries. The actual hospital charges were \$8,147,528. In addition, we estimate that, post-hospitalization, 24% of these survivors would become Medicaid recipients, and 25.4% would be on Medicaid in the years following. Thus, using estimated medical expenditures (see Table 1) the costs to Medicaid would be about \$25.2 million in the first year and \$2.4 million each year thereafter (see Table 2). In order to account for the 85% survival rate after 10 years, 1.5% of the additional year cost (see Table 2) of SCI was subtracted for each subsequent year.

Additionally, there were \$20.4 million in non-TBI/SCI injury costs billed directly to Medicaid or the State (See Table 2).

Table 2. Estimated and Actual Costs to Medicaid From MV Injuries

	Year 1	Each additional year
Traumatic Brain Injury	\$13,136,295	\$5,266,716
Spinal Cord Injury	\$25,175,837	\$2,392,396
Other	\$20,372,086	
Total	\$58,684,218	\$7,659,112
Saved By Primary Law	\$1,156,079	\$150,885

The total first-year cost to the State of Colorado for motor vehicle crashes is therefore \$58.7 million for the first year and \$7.7 million for each year after. According to NHTSA, a primary seat belt law would likely convert 40% of the non-belt users to belt users. In 2006, Colorado's seat belt use rate was 80.3%. Based on this conversion rate, one would expect belt use to

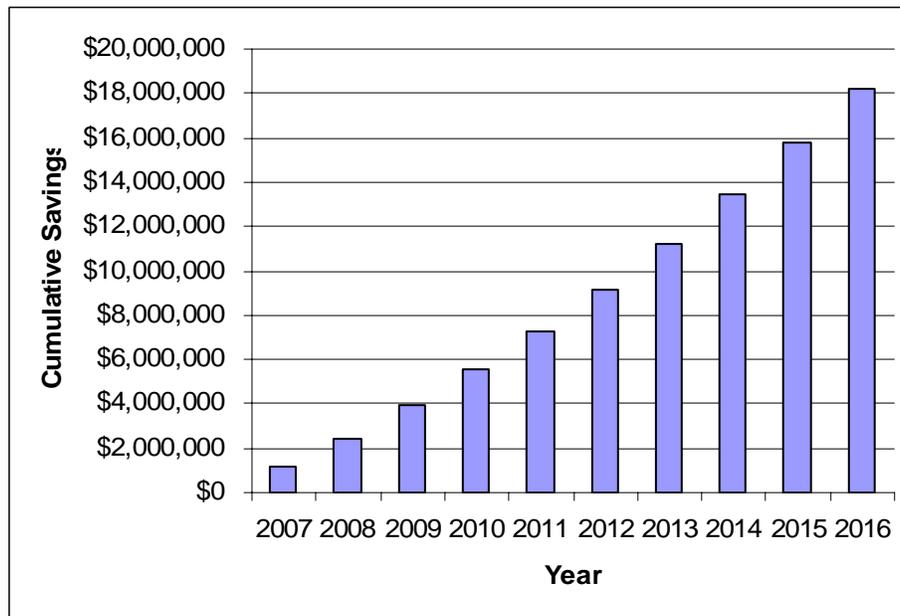
increase by 7.88% and of those newly belted individuals, at least 50% would avoid injury, based on seat belt effectiveness in reducing injury. However, the Federal Government reimburses States a portion of their Medicaid expenditures. The reimbursement rate for Colorado is 50.0%.⁸ Accounting for this reimbursement, the first-year savings to the State by implementation of a primary seat belt law would be about \$1.2 million dollars. By the fifth year the savings would be \$1.8 million for that year alone (see Table 3).

Table 3. Savings for each year by passing a primary law in 2007

Year	Values	\$ Saved
2007	Acute \$	\$1,156,079
2008	Acute \$ + Prior 1 Year LT\$	\$1,306,757
2009	Acute \$ + Prior 2 Years LT\$	\$1,455,727
2010	Acute \$ + Prior 3 Years LT\$	\$1,604,491
2011	Acute \$ + Prior 4 Years LT\$	\$1,752,548
2012	Acute \$ + Prior 5 Years LT\$	\$1,899,897
2013	Acute \$ + Prior 6 Years LT\$	\$2,046,540
2014	Acute \$ + Prior 7 Years LT\$	\$2,192,476
2015	Acute \$ + Prior 8 Years LT\$	\$2,337,705
2016	Acute \$ + Prior 9 Years LT\$	\$2,482,227

Considering the cumulative savings (adding up each year's savings), the State could expect to have saved \$7.3 million in the first 5 years and \$18.2 million over 10 years (See Figure 1).

Figure 1 Cumulative Minimum Savings by Implementation of Primary Law in 2007



CONCLUSION

The estimates reported here are *minimum* savings associated with implementation of a primary seat belt law. In this study we do not explore the peripheral costs (loss of wages and tax revenues, productivity, loss of life, etc.). Additionally, research has shown that the costs of unbelted injuries are 25% higher than belted injuries⁹ and that unbelted occupants are more likely

to be Medicaid patients. Furthermore, the assumption here is that injuries other than TBI or SCI incur no cost beyond immediate direct hospital costs (i.e., possible follow-up treatments such as surgery or physical therapy are absent from our analyses). Accounting for these ancillary expenses would drastically raise the estimates presented here.

There is also no attempt to project cost increases over time. Medical cost increases have traditionally far outpaced inflation. Costs reported here are merely small portions of the likely savings. Clearly, the State can expect to reduce other associated costs by implementation of a primary law. For example, unemployment is much higher among disabled people and family members frequently need to defer employment to become caretakers. These costs not only reduce the tax base for the State but may also add to the number of people on other State-dependent money (e.g., welfare). We also do not address the savings to private businesses and residents of the State. Last, we do not attempt to place a price on human life, pain, and suffering.

All the costs in this study are based on the conservative values. The goal was to produce **an absolute minimum value**. Whenever multiple credible values existed for an estimate, we chose the lowest value.

It should be noted that some of the estimates in this report are different from those stated in previous reports.¹⁰⁻¹² In those earlier documents, figures reported indicated *gross* costs to the State whereas the current document indicates *net* costs to the State. Implementation of a primary seat belt law would promote gross savings (i.e., not considering the Federal reimbursement) of \$2.3 million in the first year, \$14.6 million by the fifth year and \$36.5 million over the next 10 years.

In sum, the State of Colorado could expect to save at least \$18.2 million (\$36.5 million gross) over the next 10 years on its annual budget in medical costs alone by implementing a primary seat belt law in 2007.

References

1. Kahane, C.J. (2000). Fatality reduction by safety belts for front-seat occupants of cars and light trucks: Updated and expanded estimates based on 1986-99 FARS Data. Technical Report: DOT HS 809 199. Washington, DC: National Highway Traffic Safety Administration.
2. Chaudhary, N.K., & Preusser, D.F. (2003). Lives lost by States' failure to implement primary safety belt laws. Report to the National Safety Council. Available at http://www.nsc.org/public/Preusser_Study.doc
3. Craig Hospital. Available at http://www.craighospital.org/tbi/doc_costs.asp
4. Craig Hospital. Available at http://www.craighospital.org/TBI/DOC_Survival_Short.asp
5. National Spinal Cord Injury Statistical Center. Available at <http://www.spinalcord.uab.edu/show.asp?durki=21446>
6. Spinal Cord Injury Information Pages. Available at <http://www.sci-info-pages.com/facts.html>
7. Missouri Model Spinal Cord Injury Center. Available at <http://www.umshp.org/hp/resources/sci/snaps/snaps2a.htm>
8. Federal Financial Participation in State Assistance Expenditures. Available: <http://aspe.hhs.gov/health/fmap07.htm>
9. Gill, S.S., Jakub, J.W., Pease, M.C., & Woolen, C.D. (2002). The economic impact of motor vehicle crashes: The cost of restrained versus unrestrained occupants in South Carolina. *The American Surgeon*, 68:569-574.
10. Chaudhary, N.K., & Preusser, D.F. (2004). *Impact of a Primary Seat Belt Law on Missouri's State Medicaid Expenses: Estimated Minimum Savings to Missouri's Medical Budget by Implementation of a Primary Seat Belt Law*. Report to the National Safety Council's Air Bag & Seat Belt Safety Campaign. Available at <http://www.nsc.org/public/impactseatbeltonflmedicaid.pdf>
11. Chaudhary, N.K., & Preusser, D.F. (2004). *Impact of a Primary Seat Belt Law on Florida's State Medicaid Expenses: Estimated Minimum Savings to Florida's Medical Budget by Implementation of a Primary Seat Belt Law*. Report to the National Safety Council's Air Bag & Seat Belt Safety Campaign. Available at <http://www.nsc.org/public/impactseatbeltonflmedicaid.pdf>
12. Chaudhary, N.K., & Preusser, D.F. (2004). *Impact of a Primary Seat Belt Law on Virginia's State Medicaid Expenses: Estimated Minimum Savings to Virginia's Medical Budget by Implementation of a Primary Seat Belt Law*. Report to the National Safety Council's Air Bag & Seat Belt Safety Campaign. Available at <http://www.nsc.org/public/impactseatbeltonvamedicaid.pdf>

APPENDIX
Calculations**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
2007	\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27	\$7,479,682.33	\$7,443,796.39	\$7,407,910.45	\$7,372,024.50	\$7,336,138.56
2008		\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27	\$7,479,682.33	\$7,443,796.39	\$7,407,910.45	\$7,372,024.50
2009			\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27	\$7,479,682.33	\$7,443,796.39	\$7,407,910.45
2010				\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27	\$7,479,682.33	\$7,443,796.39
2011					\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27	\$7,479,682.33
2012						\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21	\$7,515,568.27
2013							\$58,684,217.56	\$7,623,226.09	\$7,587,340.15	\$7,551,454.21
2014								\$58,684,217.56	\$7,623,226.09	\$7,587,340.15
2014									\$58,684,217.56	\$7,623,226.09
2015										\$58,684,217.56
Total	\$58,684,217.56	\$66,307,443.65	\$73,894,783.79	\$81,446,238.00	\$88,961,806.27	\$96,441,488.59	\$103,885,284.98	\$111,293,195.42	\$118,665,219.93	\$126,001,358.49
Cumulative	\$58,684,217.56	\$124,991,661.21	\$198,886,445.00	\$280,332,683.00	\$369,294,489.27	\$465,735,977.87	\$569,621,262.84	\$680,914,458.27	\$799,579,678.20	\$925,581,036.69
Saved per year *	\$1,156,079.09	\$1,306,256.64	\$1,455,727.24	\$1,604,490.89	\$1,752,547.58	\$1,899,897.33	\$2,046,540.11	\$2,192,475.95	\$2,337,704.83	\$2,482,226.76
Saved Cumulative	\$1,156,079.09	\$2,462,335.73	\$3,918,062.97	\$5,522,553.86	\$7,275,101.44	\$9,174,998.76	\$11,221,538.88	\$13,414,014.83	\$15,751,719.66	\$18,233,946.42

U = Expected change in unbelted pop. By implementing primary law: 40%

O = Statewide observed belt use (S. 157): 80.3%

C = Expected percent change in population: $(U * (1 - O))$

E = Effectiveness of seat belts to reduce injury: 50%

* = Total * E * C

** Discount rates of .03 and .07 would reduce the 10 year estimate to \$15.5M and \$12.6 M respectively.

DOT HS 810 746
March 2007



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

