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Estimated Medical Cost Savings In Utah by Implementation of a Primary Seat Belt Law

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16. Abstract

This report examines 2007 hospital discharge data reporting cases where the external cause of injury to a vehicle occupant was a motor vehicle crash to predict the estimated savings to Utah if a primary seat belt law is implemented. The savings are calculated using costs based on the report Economic Impact of Motor Vehicle Crashes (DOT HS 809 446). In Utah, there is an expectation of a primary law reducing the burden of insurance companies by about $11.0 million from crashes occurring in a single year alone The residents of Utah would benefit by a reduction of more than $376,000 while the Federal Government would reduce its costs by about $351,000 before reimbursing Utah for a portion of Medicaid expenditures. Utah would also reduce its spending by more than $614,000 ($180,000 after reimbursement).

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INTRODUCTION

> On Sunday, March 18, 2007, at 1:45 a.m., a 17-year-old female was driving on East Street in Salt Lake City, Utah, when her car was struck by another vehicle. The driver of the other vehicle was an 18-year-old male. The 17-year-old woman, unbelted, was killed in the crash. The 18-year-old survived the crash. He was belted.
>
> On Saturday, May 26, 2007, at 3:26 p.m., a 21-year-old man was driving on Washington Blvd. in North Ogden, Utah, when he struck a vehicle driven by an 84-year-old man. The 21-year-old man, belted, was injured in the crash. The 84-year old man, unbelted, died.
>
> On Monday, July 23, 2007, at 5:24 p.m., a 63-year-old male was driving with four passengers on State Route 6 in Thompson, Utah, when his car was involved in a head-on collision. The 63-year-old male, belted, survived. His passengers were a belted 60-year-old female, a belted 12-year-old male, and two males 7 and 5 years old, both in child safety seats. All four passengers survived. The driver of the other vehicle, a 45-year-old man, unbelted, was completely ejected from the vehicle and died. His 19-year-old female passenger, belted, survived.
>
> On Wednesday, December 19, 2007, at 5:31 a.m., a 19-year-old male was driving on Redwood Street in West Valley City, Utah, when his car was involved in a collision. The driver of the other vehicle was a 57-year-old male. The 19-year-old man and his 22-year-old male passenger, both belted, survived. The 57-year-old man, unbelted, was killed in the crash.

Seat belts can reduce the risk of death for front-seat occupants of passenger cars by 45 percent. Similarly, belt use reduces the risk of serious non-fatal injuries by 50 percent for front-seat occupants of passenger cars. Belts are associated with a 65-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 police officers to enforce a violation of a seat belt law after observing a belt use infraction by itself. That is, the police can treat a seat belt violation as they would any other violation. Secondary laws prevent police from enforcing the belt law unless it is observed in association with another violation. That is, if the belt violation is the only visible infraction, police are not allowed to enforce the law in a secondary law State.

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

Additionally, there are real financial costs to a secondary law State. These costs associated with failure to implement a primary seat belt law are dispersed to the State's budget in terms of Medicaid and other State medical expenditures, the individual residents of the State, private insurance companies, and Federal Government. This study estimates the *minimum* dollars saved, including direct medical costs (primarily paid through Medicaid), by the implementation of a primary seat belt law in Utah.

METHODS

Medical Cost Estimates

Values from Utah's 2007 hospital discharge data were used to estimate the complete medical costs of such motor vehicle related injuries. This data includes diagnosis and cost information, payer information, and status at discharge (e.g., deceased) for each person discharged from Utah's hospitals. For diagnoses that describe injuries, there are also "E-codes" that describe the external causes of the injuries. An E-code can indicate whether the cause of the injury was a motor vehicle and whether the person injured was an occupant of a motor vehicle. It should be noted that "in theory" every injury diagnosis should have an associated E-code, but this is rarely the case. This information was used to identify the occupants of motor vehicles (excluding motorcycles) who received injuries because of crashes.

The costs listed in the database represent only the tip of the iceberg in terms of total medical costs from injuries. Especially with more severe injuries, there are often extensive medical costs incurred after hospitalization, such as follow-up medical visits, future surgeries, and rehabilitation. As such, hospital costs may grossly underestimate actual medical costs for injuries. This study used estimated medical costs provided by Blincoe et al[3] that were calculated specifically for injuries associated with motor vehicle crashes, including lifetime costs for the specific injuries associated with those crashes. They include estimates for specific body parts for each severity of injury using the Maximum Abbreviated Injury Scale (MAIS). This scale identifies the severity of the worst injury (noting that individuals may have multiple injuries) on a scale of 0 to 6. Zero indicates no injury, 1 is minor injury, up to 5 is severe injury, and 6 is not survivable (or fatal) injury. Diagnosis codes were used to map injuries to specific body parts but discharge data do not indicate the severity of injury. The distribution of injury severity by body part for MAIS 1 to 5 (excluding fatal injuries) was used to calculate an average cost per body part. The distribution was calculated by the National Center for Statistics and Analysis using an average distribution from 2002 to 2006 Crashworthiness Data System (CDS). Fatal injuries were excluded because they have no future medical costs and therefore actual hospital charges are used.

According to the Bureau of Labor Statistics, medical costs have increased 37 percent from June 2000 to May 2009. Costs from the Blincoe et al. study were adjusted by this amount to make them more likely to reflect 2009 medical costs. Table 1 shows the final estimated costs per body region in 2009 dollars. These estimates were used to calculate costs of motor vehicle crash-related injuries in Utah.

Some other adjustments are necessary to make the estimates more likely to reflect actual medical costs. E-codes do not identify whether a hospital patient was an occupant of a passenger vehicle or a large truck. Primary seat belt laws would not be expected to affect injuries sustained to occupants of large trucks, as there is a Federal primary belt law that already governs these drivers. The proportion of large trucks in NHTSA's Fatality Analysis Reporting System (FARS), a census of all fatal crashes on public roadways in the United States, was used to estimate the proportion of hospitalizations in the State that were likely occupants of large trucks and remove them from the analyses. Specifically, the General Estimate System (GES) indicates that nationally, the proportion of all fatally injured occupants that were in large trucks and buses is the same as the proportion of all non-fatal injured occupants that were in large trucks and buses. In Utah 4.0 percent of the fatal injuries were occupants of non-passenger vehicles. The costs were reduced by this amount to account for those injuries likely to stem from these large trucks.

Table 1. Costs and Injury Distribution by Body Part**

	Body Part															
	Brain		Other Head/Neck/Face		SCI		Trunk, Abdomen		Upper Extremities		Lower Extremities		Other	
MAIS	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost
1	6%	$41,655	21%	$1,621	0%	*	17%	$1,710	24%	$1,177	12%	$1,760	100%	$ 1,486
2	27%	$42,913	29%	$16,467	0%	*	24%	$15,596	32%	$7,521	29%	$11,771	0%	*
3	22%	$265,485	30%	$76,924	25%	$486,462	34%	$44,788	44%	$23,665	43%	$42,823	0%	*
4	22%	$283,031	13%	$244,250	39%	$1,130,095	19%	$72,559	0%	*	11%	$56,818	0%	*
5	23%	$383,912	6%	$126,187	36%	$1,491,788	6%	$86,265	0%	*	5%	$287,184	0%	*
M	**$224,879**		**$67,762**		**$1,103,012**		**$38,282**		**$13,052**		**$42,414**		**$1,486**	

**No Injuries of This Severity*

*** Source: NCSA analysis of 2002-2006 CDS*

A second adjustment was also made to the data to account for incomplete use of E-codes by hospitals. The percentage of all injury diagnoses that excluded E-codes (26%) was calculated and the values adjusted by that amount. This assumed that the distribution of external cause of injury would be the same for cases in which the E-code was present and when it was not (i.e. E-codes are excluded randomly across all injury sources).

Finally, it was necessary to adjust who paid some of the charges given that the Federal Government repays a portion of the State's Medicaid costs. That is, some of the charges that the database indicates belong to the State (only the portion that are Medicaid), are moved to be charges for the Federal Government. That is, the Federal Government returns 71 percent of the Medicaid charges to Utah and these cost become Federal Government expenditures.[4]

Estimates of Cost Reductions by Implementation of Primary Seat Belt Law

The cost of motor vehicle injuries was used to determine how much could be saved if a primary seat belt law was passed. This relied on estimating how much belt use would increase because of a primary seat belt law and how many fewer injuries would result from that increase.

Estimating Seat Belt Usage Increase from Primary Law

NHTSA estimates a 40 percent conversion rate for seat belt use following primary law upgrade. That is 40 percent of those who are non seat belt users will become seat belt users following a change to primary law.[5] Using this estimate, Utah's belt use among persons hospitalized for injuries sustained in a motor vehicle crash would increase from 86.0 percent to 91.6 percent (a 5.6 percentage point increase).

Estimate Belt Use Effectiveness

Once the number of people who will start wearing seat belts is established, the proportion of those people who will benefit from the seat belt can be determined. NHTSA has determined that the seat belt is roughly 50 percent effective for cars and 65 percent effective for light trucks.[1] These percentages are in terms of reduction of serious injury (MAIS 2 to 5). For less severe injuries (MAIS 1) the effectiveness is 10 percent in both vehicle types. Because hospital discharge data does not indicate the victims' vehicle types, the distribution of cars to light trucks was estimated using FARS. According to 2006 GES, the ratio of cars to light trucks is the same for injuries as it is for fatalities. The proportion of cars to light trucks for the State was identified using FARS. Given the proportion of cars to light trucks (and the proportion of injuries that are MAIS 1) the weighted average effectiveness was calculated to be 50 percent. The estimates of cost reduction assume that this percentage applies to those hospitalized as a result of motor vehicle crashes.

Calculating Savings

Medical cost savings were calculated using the expected increase in seat belt use 5.6 percent, and that 50 percent of those people will avoid injury. To turn the percentage point increase into a percent, the cost of zero belt use was calculated and 5.6 percent was taken from that. The formula for this is:

$$Cost\ at\ 0\ belt\ use = \frac{C}{1 - UE}$$

Where C = current costs, U = current belt use, and E = the effectiveness of the belt (in this case 50%). This formula was applied to each payer. These values are then multiplied by the expected percentage point increase and 50 percent (the estimated effectiveness of the belt) to determine the amount saved.

Results

There were a total of 1,341 motor-vehicle-crash-related patients discharged from Utah hospitals in 2007 (36 of them were deceased). The actual cost of these motor-vehicle-generated injuries was $44,241,258 in direct hospital costs alone. Of that, $38,451,812 of the charges were billed to insurance companies. Another $1,323,123 were paid by the patients. Utah covered $3,104,996 primarily in Medicaid expenditures and the Federal Government was charged $1,361,327 (primarily through Medicare). Another $367,436 were charges to other sources (primarily charities).

The cost increases when all medical care associated with the vehicle crashes is considered. Overall, traffic crashes cost all payers in the State $222,704,118 for injuries occurring in a single year. The estimated costs also show that insurance companies cover the greatest amount for traffic-related injuries ($192,071,459). Estimated charges are $12,387,315 for the State government and are $7,081,968 for the Federal Government. Charities and other payers can expect to pay $3,563,306. Finally, residents of Utah can expect to pay $7,600,070 for all injuries to occupants of passenger cars stemming from crashes.

Some portion of these estimated costs are expected to be decreased with the implementation of the primary seat belt law. The estimates of all cost results indicate that the greatest savings would be to insurance companies. There is an expectation of a primary law reducing the burden of insurance companies for injuries occurring in 2009 by $9,520,473 from crashes occurring in that year alone. The residents of Utah would benefit by a reduction of $376,715 while the Federal Government would reduce its costs by $351,034. Utah would also reduce its spending by about $614,006, and charities and other payers would reduce their costs by $176,624.

The Federal Government reimburses States for portions of their Medicaid expenditures. All of Utah's costs ($614,006) are Medicaid costs and therefore reimbursable by the Federal Government. The Federal Government would reimburse Utah 71 percent of its Medicaid costs ($434,164). Thus, the States net amount would decrease and the Federal Government's would increase. The last column of Table 2 shows what the post reimbursement costs would be to the State and the Federal Government.

Table 2. Costs by Primary Payer

Primary Payer	N Alive	N Dead	Actual Hospital Charges in 2007	Estimated Total Medical Costs for 2009	Saved by Primary	After Gov't Reimbursement
Insurance	1,178	30	$38,451,812	$192,071,459	$ 9,520,473	
State Gov't (e.g. Medicaid)	45	1	$3,104,996	$12,387,315	$614,006	$179,842
Federal Gov't	39	2	$1,361,327	$7,081,968	$351,034	$785,198
Paid by UT Citizens	43	3	$1,323,123	$7,600,070	$376,715	
Charity/Other	22	0	$367,436	$3,563,306	$ 176,624	
ALL	1,305	36	$44,241,258	$222,704,118	$11,038,852	

CONCLUSION

The estimates reported here are considered to be underestimations of savings associated with increased seat belt use associated with the 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 percent higher than belted injuries and unbelted occupants are more likely to be Medicaid patients.[6]

There is also no attempt to project cost increases over time as far as what the savings would be in future years. Medical cost increases have traditionally far outpaced inflation. Costs reported here are merely small portions of the likely savings. Clearly, the State, its residents, and other payers can expect to reduce other associated costs by implementation of a primary enforcement seat belt law. For example, unemployment is much higher among disabled persons and family members frequently needing 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 funds such as welfare. This report does not address the savings to the private sector in Utah. Last, no attempt has been made to place a price on human life, pain, and suffering.

All the costs in this study are based on conservative values. The goal was to produce a value that could be considered an absolute minimum value and the authors chose to err on the conservative side when in doubt.

In summary, Utah could expect to save at least $614,000 ($180,000 after reimbursement) from injuries prevented in 2009 alone on its medical costs. The total savings to all payers will be more than $11.0 million dollars.

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