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Estimated Medical Cost Savings in New Hampshire by Implementation Of a Primary Seat Belt Law

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16. Abstract

This report examines 2005 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 the State of New Hampshire 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 New Hampshire, there is an expectation of a primary law reducing the burden of insurance companies by about $5.1 million from crashes occurring in a single year alone. The citizens of New Hampshire would benefit by a reduction of $1.2 million while the Federal Government would reduce its costs by $1.2 million. The State of New Hampshire would also reduce its spending by more than $400,000.

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INTRODUCTION

> On Tuesday, March 28, 2006, at 10:28 a.m., two vehicles were traveling on an urban minor arterial road in Rochester, New Hampshire. The driver of the first vehicle, an unbelted 63-year-old man, died. The driver of the other vehicle was a 48-year-old female. The woman, properly restrained, survived.

> On Tuesday, April 29, 2006, at 7:56 a.m., a 61-year-old woman was driving on an urban local street in Bedford, New Hampshire, when she struck another vehicle. The other vehicle was driven by a 50-year-old man. The man, belted, survived. The woman, not wearing a seat belt, died.

> On Wednesday, July 12, 2006, at 6:08 a.m., an 18-year-old male was driving on a rural principal arterial road in Hopkington, New Hampshire, when he was involved in a head-on collision. The other vehicle was driven by a 37-year-old female. The young man, belted, survived. The woman, not wearing a seat belt, died.

> On Friday, August 25, 2006, at 4:24 p.m., three vehicles were involved in a crash on SR-106 in Belmont, New Hampshire. The driver of one vehicle, an unbelted 30-year-old female, was killed. The driver of the second vehicle, a 68-year-old male, was uninjured in the crash. He was belted. The driver of the third vehicle, a belted 45-year-old male was uninjured. His 21-year-old male passenger, belted, survived.

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 65% 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.

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 are real financial costs to a 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 the Federal Government. This study estimates the *minimum* dollars saved, including those direct medical costs (primarily paid through Medicaid), by the implementation of a primary seat belt law in New Hampshire.

METHODS

Medical Cost Estimates
New Hampshire's 2005 Hospital Discharge Data were used for the analyses. Only cases where the external cause of injury to a vehicle occupant (excluding motorcycles) was a motor vehicle crash, as determined by "E-Codes," were included. There were a total of 639 such patients discharged from New Hampshire hospitals in 2005 (23 of them were deceased). The cost of these motor-vehicle-generated injuries was $26,708,247 in direct hospital costs alone. Of that, $13,765,003 of the charges were billed to insurance companies. Another $4,583,741 were paid by the patient. The State of New Hampshire covered $3,827,236 primarily in Medicaid expenditures and the Federal Government was charged $4,532,264 (primarily through Medicare).

However, these costs are merely the "tip of the iceberg." Serious injuries and even minor injuries are likely to produce future follow-up visits to the hospital or a primary care physician. The more serious injuries may require further surgery and perhaps rehabilitation.

We used Blincoe et al.'s[3] report on the economic impact of motor vehicle crashes as the basis for generating costs to estimate more complete medical costs. This report identifies costs for medical treatment (among other costs) by injury severity and body part. The injury severity was coded using MAIS (Maximum Abbreviated Injury Scale) which identifies the severity of the worst injury. These costs include all future medical care for injuries sustained by a given motor vehicle crash. According to the Bureau of Labor Statistics medical costs have increased 35% from 2000 to 2007. We therefore adjusted the Blincoe et al. costs by this amount to make them more likely to reflect 2008 medical costs.

All the diagnosis codes (ICD-9) were used to identify the most severe injury (i.e., the one with the highest cost as per Blincoe et al., 2000). Given that Blincoe's report identifies costs per body part, the ICD-9 codes were then sorted into body part locations using the CDC's "Barell Injury Diagnosis Matrix," which classifies some ICD-9 codes into body region and nature of the injury. The primary payer of the charges was provided in the discharge database.

Discharge data do not generally contain MAIS injury levels that are needed to apply the appropriate cost estimate. The data for the current report are only from those crash victims who have actually been hospitalized. As such, injury distributions of hospitalized crash victims were estimated by the National Center for Statistical Analysis. This distribution, which is an average distribution from 2002 to 2006 Crashworthiness Data System (CDS), was used to compute an average cost per body region (See Table 1). For some body regions some MAIS levels were nonexistent for the distribution used in the 2000 Blincoe et al. report (e.g., Traumatic Brain Injury—TBI—had no MAIS 1 or 2 severities). In these cases we used the distribution for the relevant injury levels only (e.g., the distribution of MAIS 3 to 5 for TBI).

For fatal injuries, Blincoe et al.'s average costs include those people who died at the scene or who were dead-on-arrival to the hospital. For those individuals, medical costs would be relatively low. The New York State Dept. of Health, Bureau of Injury Prevention[4] estimated that 50% of the fatally injured motorists were admitted beyond the emergency department. The bulk of medical costs for those killed in crashes who were actually admitted into the hospital (i.e., the current "sample") are likely to stem from those hospital charges (plus some emergency room costs). Therefore, instead of using estimated costs for these motorists we used actual hospital charges (which omit any emergency department charges).

<u>Conservative Estimations</u>
It should be noted that this method will underestimate actual medical costs. It is unlikely that E-codes capture all crashes as their use tends to be inconsistent. Next, in cases where we had no estimate of cost because we could not map the ICD-9 code to a body region, we used actual cost which only includes current hospitalization and not future medical charges. Lastly, all ICD-9 codes that map to "Other" are assumed to be MAIS 1 in order to err on the side of conservatism. It is unlikely that these injuries are all MAIS 1 and are likely to cost significantly more than $1,465—the estimated cost for all "other" injuries (See Table 1).

<u>Estimates of Cost Reductions by Implementation of Primary Seat Belt Law</u>
Once we obtained a dollar value for motor vehicle injury costs, a determination of how much would be saved as a result of a new primary seat belt law was made. NHTSA estimates that 40% of nonusers would become belt users as a result of the primary law. This would mean that there would be a 14.5-percentage-point increase in belt use since New Hampshire's belt use in 2007 was 63.8%. As it is based on an upgrade from a secondary seat belt law to a primary seat belt law, the potential percentage increase in New Hampshire is likely to be much higher since the state does not presently have an adult seat belt law of any kind. The law would likely only be effective for occupants of passenger vehicles. According to GES the percentage of non-fatally injured occupants of heavy commercial vehicles and buses was the same as the percentage for fatally injured occupants. Therefore we used FARS to estimate the percentage of occupants that would likely be from heavy commercial vehicles and removed that percentage from the total hospitalization cost.

The seat belt is roughly 50% percent effective for cars and 65% effective for light trucks. These percentages are in terms of reduction of serious injury. For less severe injuries (MAIS 1) the effectiveness is 10% in both vehicle types. According to GES the ratio of cars to light trucks is the same for injuries as it is fatalities. Therefore we used FARS to identify the ratio of cars to light trucks for the state. The weighted average effectiveness was calculated to be 48%. The estimates of cost reduction assume that these percentages apply to those hospitalized as a result of motor vehicle crashes.

The *Total Cost of Injury* was derived from state hospital discharge data and adjusted to reflect occupants of passenger cars and light trucks as described above. Then, the total cost of zero belt use was calculated using the formula: *Cost of Zero Belt Use = Total Cost of Injury /(1-UE)*, where *U* is the belt use rate for the State and *E* is the weighted average effectiveness of the seat belt (i.e., 48%). The *Cost of Zero Belt Use* was then multiplied by the expected percentage-point increase in belt use and the average effectiveness of the seat belt. Finally, the Federal Government reimburses New Hampshire 50% of its Medicaid costs.[5] Therefore we applied 50% of the savings calculated to Medicaid to the Federal Government. For purposes of these calculations it was assumed that the same payer would continue to be responsible for all future estimated costs.

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%	$41,047	21%	$1,597	0%	*	17%	$1,685	24%	$1,160	12%	$1,735	100%	$1,465
2	27%	$42,286	29%	$16,227	0%	*	24%	$15,368	32%	$7,412	29%	$11,599	0%	*
3	22%	$261,610	30%	$75,801	25%	$479,361	34%	$44,134	44%	$23,320	43%	$42,198	0%	*
4	22%	$278,899	13%	$240,685	39%	$1,113,597	19%	$71,500	0%	*	11%	$55,989	0%	*
5	23%	$378,308	6%	$124,344	36%	$1,470,010	6%	$85,005	0%	*	5%	$282,991	0%	*
M		$221,596		$66,772		$1,086,910		$37,723		$12,862		$41,795		$1,465

*No Injuries of This Severity
** Source: NCSA analysis of 2002-2006 CDS

RESULTS

There were 639 individuals identified as having been admitted into a New Hampshire hospital from injuries stemming from a motor vehicle crash in 2005. Twenty-three of these individuals were mortally injured. The 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 2007 by about $5.1 million from crashes occurring in the first year alone. The citizens of New Hampshire would benefit by a reduction of $1.2 million while the Federal Government would reduce its costs by $1.2 million. The State of New Hampshire would also reduce its spending by more than $400,000.

It should be noted that the initial savings to New Hampshire would actually be about $800,000, considering that the Federal Government reimburses the State 50% of its Medicaid costs.

Table 2. Costs by Primary Payer

Primary Payer	N Alive	N Dead	Actual Hospital Charges in 2005	Estimated Total Medical Costs for Injuries Occurring in 2007	Saved By Primary
Insurance	347	17	$13,765,003	$50,541,220	**$5,063,447**
State Gov't (e.g., Medicaid)	62	2	$3,827,236	$8,008,639	**$401,171**
Federal Gov't	92	2	$4,532,264	$7,586,680	**$1,161,238**
Paid by NH Citizens	115	2	$4,583,744	$12,258,664	**$1,228,128**
ALL	**616**	**23**	**$26,708,247**	**$78,395,203**	**$7,853,984**

CONCLUSION

The estimates reported here are considered to be underestimations of 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 injuries and that unbelted occupants are more likely to be Medicaid patients.[6]

There is also no attempt to project cost increase 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 citizens, and other payers 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 funds (e.g., welfare). We also do not address the savings to the private sector in the State. Lastly, we do not attempt to place a price on human life, or on pain and suffering.

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

In sum, the State of New Hampshire could expect to save at least $400,000 ($800,000 gross) from injuries prevented this year alone on its Medicaid budget. The total savings to all payers will be at least $7.9 million.

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