

ECONOMIC CONSEQUENCES OF TRAFFIC ACCIDENTS IN THE BALTIC COUNTRIES

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Among the many challenges faced by the Baltic countries, traffic accidents may at first seem unimportant. However, this study shows that they consume somewhere between 1.5 percent and 2.5 percent of the gross domestic product. Effectively dealing with this problem could go a long way towards reducing these costs and returning them to productive use in the considerably strained economies.

The Problem

Although the Baltic countries had the best highways within the former Soviet Union, their roads were not equipped to handle the increased traffic and mobility of the independence era. As a result, traffic accidents have increased significantly along with associated economic losses and social consequences.

Statistical data indicate that fatalities in traffic accidents per 10,000 registered vehicles are more numerous in the Baltic countries than in Western Europe, but lower than for their eastern neighbors. Table 1 shows that even though the Baltic countries have lower traffic accident rates, they still have a long way to go to catch up with those of Western Europe.

Data from 1998 traffic accidents reveal that there were 6,445 reported traffic accidents in Lithuania (Karaliūnas 1999), 4,540 in Latvia (Briksne 2000), and 1,613 in Estonia (Kannel 2000). These accidents resulted in 829 fatalities in Lithuania, 627 in Latvia and 284 in Estonia. Although it is known that most traffic accidents bring about economic loss, they have not been quantified on an objective basis in any of the three countries. This study provides a rudimentary assessment of these losses.

Table 1
Fatality Rates in 1998

Country	Fatalities/ 10,000 vehicles
Estonia	5.5
Latvia	15.6
Lithuania	9.6
EU	3.6
Scandinavia	2.0
Russia	19.1
Bielorussia	19.7
Ukraine	23.0

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Approach

To estimate the costs of traffic accidents, the author employed a methodology developed by the National Highway Traffic Safety Administration (NHTSA) of the U. S. Department of Transportation. The NHTSA study was published in 1996 under the title *Economic Cost of Motor Vehicle Crashes* (Blincoe 1996). The study estimated that the cost of motor vehicle accidents in the U. S. in 1994 was \$150.5 billion. This total is based on the cost of 9,701,040 vehicle crashes, in which

there were 40, 676 fatalities and 4. 09 million nonfatal injuries. Costs include medical services, productivity losses, property damage, emergency services, insurance administration, premature funeral costs, vocational rehabilitation, legal expenses, and costs to employers. Injury cost estimates are based on the severity of injuries measured by the Abbreviated Injury Scale (AIS) (AAAM, 1990).

The AIS provides a convenient, but imperfect, basis for stratifying social costs. Estimated soon after the accident occurs, AIS codes indicate the threat to life resulting from injuries. AIS 1 represents a severity that is barely perceptible and AIS 6 the most severe injury, including death. In general, more serious injuries have more serious outcomes. However, in many instances, outcome is not accurately predicted by the initially assigned AIS code. For example, some injuries with low AIS codes, such as lower extremities injuries, can result in serious long-term outcomes. The average unit cost estimates do not take into account the age, sex, and health status of any individual.

This analysis is based on the average costs of injuries in the U. S. adjusted to the Baltic base. The averaging approach is valid for comparing aggregate costs at a nationwide level, but not for estimating the cost of individual cases.

To calculate economic losses for the three countries using the NHTSA methodology, the following adjustments were made to the U. S. based unit cost estimates:

1. In recognition of the considerably lower labor costs in the Baltic countries related labor and productivity unit costs in the US. all divided by four;
2. U. S. vehicle unit costs were divided by three to account for an aged automobile fleet in the Baltic countries and lower repair costs;
3. Medical unit costs were divided by two to reflect the considerably lower costs of medical services, but the nearly equal costs of medical supplies and physical rehabilitation equipment;
4. It is assumed that the distribution of crash intensities in traffic accidents are similar; i. e., there are fewer high-speed than low-speed collisions;
5. It is assumed that injury severity distributions sustained in traffic accidents are similar;
6. Administration of insurance, police and court service costs as well as expenses caused by traffic delays are unknown and could not be estimated;
7. It is assumed that the average cost of a crash of a particular severity is similar in Estonia, Latvia and Lithuania.

It is recognized that accident and injury data from the three countries are limited in depth and may not have been collected and recorded on a uniform basis. Official data and estimates for each of the three countries are shown in Table 2.

Table 2
Number of Accidents and Injuries in Estonia, Latvia, and Lithuania in 1998

Country	Reported Injury Crashes	All Accidents (reported and unreported)	Reported Fatalities	Reported Injured	Estimated Total Injured	Property Damage Only (PDO) Accidents
Estonia	1, 613	6, 258(1)	284	1, 989 2, 627(1)	5, 121(1)	2, 422(1)
Latvia	4, 540	17, 634(1)	627	5, 799(1)	14, 178(1)	6, 547(1)
Lithuania	6, 445	25, 034	829	7, 667	20, 512(1)	9, 290(1)

(1) Estimate based on Lithuania's traffic accident distribution.

Data from Lithuania reveal that there were a total of 25, 034 vehicle-related accidents of which 6, 445 were injury producing (KD Informacija 1999). In the injury producing accidents there were 829 fatalities and 7, 667 injuries. Estonia reported 1, 613 injury producing accidents, which resulted in 284 fatalities and 1, 989 injuries (Kannel 2000), but had no data on the total number of traffic accidents for 1998. The only data available from Latvia indicated that there were 4, 540 injury accidents in which there were 627 fatalities. Since the data from Lithuania were more complete, they were used to estimate the total number of injuries in Latvia and Estonia by multiplying the number of reported fatalities in each of the two countries by the ratio of injuries/fatalities in Lithuania. Similarly, the total number of vehicle accidents, injury producing plus property damage only (PDO), in Latvia and Estonia were determined by multiplying their number of reported injury producing accidents by the ratio of the total number of vehicle crashes divided by the number of police reported injury producing crashes in Lithuania. Further adjustments in the number of injuries were made by making the assumption that one half of the unreported crashes included low-level injuries to occupants at the maximum injury severity (MAIS) levels of 1, 2. and 3. Unreported accidents and injuries are also accounted for in the NHTSA study (Blincoe 1996).

Property Damage	440	1,088	1,119	1,924	2,780	102	226
Subtotal	502	1,190	1,221	2,026	2,882	2,673	3,046
						2,775	3,272

Table 5
Estonia's 1998 Traffic Accident Costs (USD)

	PDO	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Numbers involved								7,826
Medical							283	12,578,
Funeral	2,422	4,041	713	348	13	6	1,140,301	091
EMS	0	1,931,598	2,903,336	4,883,136	655,200	1,064,520	453,932	453,932
Vocat.	0	0	0	0	0	0	149,141	708,978
Rehab	33,908	307,116	119,784	88,044	7,475	3,510	0	105,333
Market	0	28,287	34,937	37,584	2,665	1,860	27,180,	34,165,
Product.	0	1,328,489	2,075,543	3,112,512	188,734	279,630	452	360
HH	24,220	416,223	641,700	948,300	60,918	81,180	6,255,621	8,428,162
Productivity	0	0	0	0	0	0	0	0
Insur.	26,642	420,264	299,460	319,464	13,403	10,572	530,059	1,619,864
Administr.	0	0	0	0	0	0	0	0
Workplace	84,770	4,431,977	6,074,760	9,389,040	928,395	1,441,272	35,709,	58,067,
Costs							506	546
Legal Costs	150,164	412,182	72,726	35,496	1,326	612		
Subtotal	1,065,680	4,396,608	797,847	669,552	36,140	16,038	63,958	736,464
Travel Delay	1,215,844	4,808,790	870,573	705,048	37,466	16,650	862,018	7,843,883
Property							925,976	8,580,347
Damage								66,647,
Subtotal								893
Total								

Table 6
Latvia's 1998 Traffic Accident Costs (USD)

	PDO	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Numbers invol.								
Medical								
Funeral	6,5a47	11,271	1,998	973	25	11	627	
EMS	0	5,387,538	8,135,856	13,653,136	1,260,000	1,951,620	2,526,392	3,2914,542
Voc. Rehab	0	0	0	0	0	0	1,062,138	1,062,138
Mkt.	91,658	856,596	335,664	246,169	14,375	6,435	330,429	1,881,326
Productiv.	0	78,897	97,902	105,084	5,125	3,410	0	290,418
HH	0	3,708,158	5,816,178	8,702,512	362,950	506,715	60,219,588	79,316,101
Productiv.	65,470	1,160,913	1,798,200	2,651,425	117,150	148,830	13,859,626	19,801,614
Ins.	0	0	0	0	0	0	0	0
Administr.	72,017	1,172,184	839,160	893,214	25,525	19,382	1,174,371	4,195,853
Workpl.	0	0	0	0	0	0	0	0
Costs	229,145	12,364,286	17,022,960	26,251,540	1,785,392	2,636,392	79,172,54	139,461,992
Legal Costs								
Subtotal	405,914	1,149,642	203,796	99,246	2,550	1,122	141,702	2,003,972
	2,880,680	12,262,848	2,236,762	1,872,052	69,500	29,403	1,909,842	21,260,087
Travel Delay	3,286,594	13,412,490	2,439,558	1,971,298	72,050	30,525	2,051,544	23,264,059
Property								162,726,051
Damage								
Subtotal								
Total								

Table 7
Lithuania's 1998 Traffic Accident Costs

	PDO	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Numbers involved	9,290	16,052	2,834	1,550	54	22	829	
	0	7,672,856	11,540,048	21,749,600	2,721,600	3,903,240	3,340,317	50,927,661

Medical	0	0	0	0	0	0	936,217	936,217
Funeral	130,060	1,219,952	476,112	392,150	31,050	12,870	436,883	2,699,077
EMS	0	112,364	138,866	167,400	11,070	6,820	0	436,520
Vocat.	0	5,281,108	8,249,774	13,863,200	783,972	1,013,430	79,620,476	108,811,960
Rehab	83,610	1,653,356	2,550,600	4,223,750	253,044	297,660	18,324,769	27,386,789
Market	0	0	0	0	0	0	0	0
Product.	102,190	1,669,408	1,190,280	1,422,900	55,134	38,764	1,552,717	6,031,393
HH	0	0	0	0	0	0	0	0
Productivity	315,860	17,609,044	24,145,680	41,819,000	3,855,870	5,272,784	104,211,379	197,229,617
Ins.								
Administr.	575,980	1,637,304	289,068	158,100	5,508	2,244	187,354	2,855,558
Workplace	4,087,600	17,464,576	3,171,246	2,982,200	150,120	58,806	2,525,134	30,439,682
Costs	4,663,580	19,101,880	3,460,314	3,140,300	155,628	61,050	2,712,488	33,295,240
Legal Costs								230,524,857
Subtotal								
Travel								
Delay								
Property								
Damage								
Subtotal								
Total								

Table 8
Gross Domestic Product in 1998

Country	GDP (\$ billions)
Estonia (Kannel 2000)	4. 58
Latvia (Briksne 2000)	6. 53
Lithuania (Karaliūnas 1999)	10. 75

Relative significance of individual loss sectors

Comparing the calculated losses by individual sectors shows the injury sector being considerably higher than the property damage sector in the Baltic countries. Compared to Estonia, Latvia's injury cost sector is 2. 4 times higher and the property damage sector 2. 7 times. Lithuania's injury sector is 3. 4 and the property damage sector 3. 88 times higher than those of Estonia. If the comparison was based solely on the size of the vehicle fleet in each country, Latvia's costs should be 0. 78 times that of Estonia and Lithuania's approximately 1. 68 times, it is believed, that the most important factor in Estonia's favor is its much lower fatality rate as noted in Table 1. Estonia's vehicles are considerably newer and more of them are of Western European manufacture than those of Latvia and Lithuania (Karaliūnas 1999). Accordingly, it is reasonable to assume that the Estonian vehicle fleet has better crashworthiness and improved occupant protection systems.

In general, losses in market productivity make up nearly 50 percent of the total losses for the injury sector. They are followed by medical costs at approximately 25 percent and household productivity at 15 percent. In contrast, emergency medical services amount to less than 2 percent of the total costs. Much of the medical costs and market and household productivity losses could be significantly reduced if the response time for emergency medical services was quick and the medical team competent and well equipped to provide sufficient victim care and stabilization at the accident location. While the author does not have any information about Latvian and Estonian emergency services, in Lithuania they appear to be poorly organized to respond in a timely manner and badly equipped to provide the most essential medical services at the scene of the accident (Jurgutienė 2000). There is general agreement in the medical profession in the U. S. and the European Community that 50 percent of fatalities could be avoided and quicker healing realized if emergency medical services were provided within the "golden hour" in case of a critical injury (McNicholl 1994). The survival rate decreases to approximately 15 percent if emergency medical services are delayed by two hours or more. The benefits of quicker healing and earlier return of the injured to productive life are also true at lower injury severity. Accordingly, in the overall cost context, it would be far more cost effective to pay more attention to improving the response and quality of emergency medical services. The above approach would also significantly reduce the costs of long-range healing and rehabilitation.

Accuracy of estimates

How accurate are these loss estimates? While data for comparison are scarce, particularly for Latvia and Estonia, Lithuania's Highway Traffic Institute estimates annual costs of traffic accidents in Lithuania as high as 1,300 million litas (\$325 million), while the World Bank estimates them to be 800 million litas (\$200 million) (Karaliūnas 1999). Cost of an average PDO accident is estimated to be 3,000 litas (\$750) (Gabertas 2000) versus \$502 in this study. An estimate of

unknown origin (KD Informacija 1998) shows the loss of human life in traffic accidents in Lithuania is valued at 1,055,933 litas (\$234,000). The unit cost of a fatality in this study is \$187,000.

It is recognized that these estimates take into account only those cost segments of accidents of which there is a reasonable amount of knowledge. Other cost segments—such as insurance administration, courts, attorney, and police—could not be accounted for. Furthermore, U. S. experience shows that the number of reported accidents do not reflect their real number. Reports from Lithuania indicate that, in many traffic accidents, people try to avoid police involvement because of mistrust and because of mandatory fines of anywhere between 100 and 500 litas (\$25 to \$125) (Gabertas 2000).

The U. S. accident data indicate that the ratio of injuries to fatalities should be around 80 to 1 rather than the ratios reported in the Baltic literature at approximately 9 to 1 for Lithuania, 7 to 1 for Latvia and 6 to 1 for Estonia. If the U. S. ratio of 80 to 1 were applied to the Baltic countries, the property damage estimate would increase 13-fold for Estonia, 11.5-fold for Latvia, and 9-fold for Lithuania. Property damage costs could rise by about \$14 million for Estonia, \$31 million for Latvia, and nearly \$37 million for Lithuania. Thus total economic losses in Estonia could run as high as \$80 million, in Latvia \$190 million, and in Lithuania \$260 million.

Social implications

Economic costs are only one consequence of motor vehicle crashes. Injured persons often suffer physical pain and emotional anguish that is beyond any economic compensation. Permanent disability, such as paraplegia, quadriplegia, loss of eyesight, or brain damage, can deprive an individual of the ability to achieve even minor goals and result in dependence on others for economic support and routine physical care. Less serious, but more common, injuries to ankles, knees, and cervical spine can result in chronic physical pain and limit the victim's physical activities for years. Serious burns, contusions, or lacerations can lead to emotional trauma associated with permanent disfigurement. From an individual standpoint, these can be the most devastating consequences of a motor vehicle crash, regardless of any economic compensation through insurance, welfare or the legal system.

Serious repercussions also are felt by those close to the victim. Caring for a disabled person represents a considerable burden to the family, both economically and emotionally, and can limit individual and family activities. The emotional consequences of the victim's physical problems can often result in personality problems that may drastically alter family relationships. Sudden, unexpected and permanent separation from loved ones can cause grief, anguish, guilt, fear, insecurity and withdrawal for years.

Action taken by society to alleviate the individual suffering of its members or to reduce the incidence of this suffering would be justified in itself. In this context, it would be useful to determine the net cost to society of programs that are primarily based on humane considerations. If the focus of policy decisions were purely on the economic consequences of motor vehicle crashes, the most tragic and possibly the most costly aspect of such crashes would be overlooked.

Conclusions

The estimated economic costs of motor vehicle traffic accidents in 1998 were in the range of \$66.6 to \$80.6 million for Estonia, \$162.7 to \$194.7 million for Latvia, and \$230.5 to \$267.5 million for Lithuania. The majority of these expenses are related to the injury segment, in which the loss of market productivity, household productivity and medical care predominate. Property damage represents approximately 16 percent for Estonia and 17 percent for Latvia and Lithuania.

It is acknowledged that the approximations and assumptions used in this study are rather crude and probably not very accurate. The continuously changing profile of the vehicle fleet, traffic dynamics and densities provide a base, full of uncertainties, that would challenge anybody's ability to come up with a firm and stable cost estimate of these losses. Nevertheless, if carried out on a uniform basis and with consistent methodology, the estimate provides a useful tool to assess the magnitude of the problem in the context of the gross domestic product, the national budget, and its significance relative to other budgeted expenditures.

Focus on the costs of motor vehicle crashes does not take into account the more intangible consequences of these events to individuals and families and should not be used to produce benefit-cost ratios. Measurement of the monetary value of intangible consequences, such as pain and suffering, has been undertaken in numerous studies. However, most authors agree that the devastating consequences of motor vehicle crashes are far greater than can be measured and expressed in financial terms.

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