

ESTIMATES OF THE ECONOMIC AND HUMAN CONSEQUENCES  
OF MOTOR VEHICLE ACCIDENTS IN VIRGINIA

by

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(The opinions, findings, and conclusions expressed in this  
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## ABSTRACT

The 1980 Crash Facts shows that 1,045 people were killed and 58,036 injured in the 116,382 motor vehicle crashes that occurred in Virginia during 1980. Crash Facts estimates that these accidents imposed an economic loss of \$690,000,000. The death and injury figures are disaggregated in many ways, but two statistics are missing. First, the economic loss is not divided into its component parts. Rigorous analysis requires that the separate components of economic loss be identified and estimated before they are summed into a single estimate. Second, little attempt is made to describe the severity of the crash victims' injuries. An investigation into these injuries would not only improve the cost estimate, it also would help place the traffic safety problem in the human context of pain and suffering rather than the abstract terms of dollars and cents. This report is an attempt to derive the two missing statistics.



## ACKNOWLEDGMENTS

Richard Mapp of the Council staff is recognized for assembling and documenting the financial and medical data presented throughout this report. Many of the tables and figures would have been incomplete had it not been for his efforts.



## SUMMARY OF FINDINGS

### 1. Monetary Costs

In 1980, losses from traffic accidents in Virginia totalled at least three-quarters of a billion dollars. Because this finding was derived from a conservative methodology, the reported figure probably understates the true extent of loss.

### 2. Human Costs: Fatalities

Over one thousand Virginians died in traffic accidents during 1980. Motor vehicle accidents were the sixth leading cause of death for all Virginians and the leading cause of death for those between the ages of one and thirty-four.

### 3. Human Costs: Injuries

A significant number of emergency room admittees are traffic accident victims. Further, motor vehicle injuries are disproportionately severe, accounting for one-third of the cases of paraplegia and quadraplegia, and half of the cases of brain damage suffered during 1980.

## CONCLUSION

Traffic accidents in Virginia impose high costs upon the economy of the Commonwealth and the health of her citizens.





## PURPOSE

This research sought to specify and estimate components of the monetary and medical losses imposed by traffic accidents in Virginia. Specific attention was directed toward assembling estimates that do not appear in Crash Facts, the annual report on traffic losses published by the Virginia State Police. Lastly, the research sought to identify sources of financial and health statistics that were updated annually and suitable for transcription into a traffic loss data bank.

## SCOPE

The research was designed to measure traffic accident costs in Virginia for one year. Future research will be directed toward year-by-year comparisons of traffic losses. The most recent year for which adequate data were available was 1980, and the report focuses on that year.

## METHODOLOGY

For deriving monetary costs, the methodology used in this report paralleled that found in Accident Facts, a nationally recognized authority on accident costs that is published by the National Safety Council. Because this report focuses on Virginia, a premium has been placed upon using information specific to this state. Various state agencies supplied the bulk of this information.

Information on fatalities was solicited from the Virginia Bureau of Vital Statistics, and information on injuries was obtained from a Virginia hospital and a Virginia rehabilitation facility.

Throughout this report it has been necessary to disaggregate reported figures by using percentage distributions from earlier epidemiological studies. These studies are not repeated each year, so one must assume that the distributions have not changed significantly over time.



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Table 1 provides estimates for the various components of economic loss resulting from motor vehicle accidents in Virginia during 1980. The table is followed by a line-by-line description of the sources and methods that were used to derive the figures.

Table 1

Costs of Motor Vehicle Accidents in Virginia by Type — 1980  
(Dollars)

Indemnity Compensation:

Losses Incurred by Type of Coverage:

( 1)	Private Passenger Auto Liability	273,720,000
( 2)	Commercial Auto Liability	69,911,000
( 3)	Private Passenger Auto Physical Damage	101,481,000
( 4)	Commercial Auto Physical Damage	<u>16,108,000</u>
	Total Losses Incurred	461,220,000

Insurance Administration Costs:

Premiums Earned Less Losses Paid by Type of Coverage:

( 5)	Private Passenger Auto Liability	166,891,000
( 6)	Commercial Auto Liability	51,175,000
( 7)	Private Passenger Auto Physical Damage	74,122,000
( 8)	Commercial Auto Physical Damage	<u>11,504,000</u>
	Total Premiums Earned Less Losses Paid	303,692,000

Workmen's Idemnity Compensation by Type of Accident:

( 9)	Motor Vehicle Accidents	2,339,000
(10)	Struck by Motor Vehicle	2,480,000
(11)	Struck against Motor Vehicle	828,000
(12)	Uncompensated Wage Loss	3,987,000
(13)	Social Security Disability and Survivors' Payments to Workers and Dependents	<u>2,394,000</u>
	Total Workmen's Indemnity Compensation	<u>12,028,000</u>
	Grand Total	<u><u>776,940,000</u></u>

### Losses Incurred

Lines 1 and 2 show the insurable losses Virginia's private and commercial motorists claimed during 1980. Motorists report these losses to their insurance companies, and the companies submit these figures to the Bureau of Insurance. The Bureau of Insurance aggregates the companies' submissions and annually reports the total losses incurred on insurance transacted in Virginia.

While lines 1 and 2 represent losses incurred on liability policies, lines 3 and 4 show losses incurred on collision policies. The Bureau of Insurance reports losses incurred on policies against physical damage to private and commercial vehicles. For 1980, such losses totaled \$150,120,000 for private autos and \$25,131,000 for commercial vehicles. Unfortunately, insurance against physical damage includes both collision and comprehensive coverages. For the purposes of this memorandum, losses that would be claimed under comprehensive policies — thefts, vandalism, fire, etc. — should not be included in losses attributable to traffic accidents. Therefore, the physical damage figures were discounted to exclude the comprehensive coverage.

The most accurate estimate of the collision share of physical damage insurance was provided by a representative of A. M. Best Company, Inc., the organization that publishes Best's Insurance Aggregates and Averages. The analyst totaled the collision and physical damage premiums received by ten New York insurers on their private passenger and commercial auto policies, and reported collision as a percent of all physical damage. Proprietary interests prevented the release of the companies' names, but the analyst did report the highest and lowest percentages as 76% and 39% for private passenger vehicles and 74% and 27% for commercial vehicles. The weighted average percentages were 67.6% for the former and 64.1% for the latter.

The average percentages were used to deflate the Bureau of Insurance's physical damage figures and derive the collision figures in lines 3 and 4.

### Insurance Administration Costs

According to Accident Facts, which is published by the National Safety Council, insurance administration cost is the insurance companies' "cost of doing business and it is a part of the accident cost total." Roughly, this item captures the costs of providing the insurance offices and equipment, the salaries for agents and adjusters, and the profits associated with automobile insurance. The premiums

earned and losses paid\* under private passenger and commercial auto liability and physical damage coverages are reported by the Bureau of Insurance. Again, the reported figures for physical damage were discounted to exclude the cost of administering comprehensive policies. This was done by employing the percentages reported by A. M. Best Company, Inc.

### Workmen's Compensation

Lines 9, 10, and 11 show the amount of workmen's indemnity compensation paid to employees whose injuries were attributed to moving motor vehicles. The Department of Labor and Industry, through its supplementary data system, records indemnity compensation payments by type of accident. During 1980, the cases of 28,360 injured workmen were closed. Traffic injuries fall into three of the accident categories: "motor vehicle accidents," "worker struck by object," and "worker struck against object." Of the 28,360 cases closed in 1980, motor vehicle accidents accounted for 1,072. The average payment to these 1,072 workers was \$2,182, for a total outlay of \$2,339,000. In order to estimate cost figures for the other two types of accidents, it was necessary to estimate the number of times workers were struck by or against a moving motor vehicle.

Accident Facts publishes an excerpt from the National Health Survey that implicitly reveals the national total for work accidents involving moving motor vehicles. For the years 1977-1979 an average of 6,726,000 workers received bed-disabling or activity-restricting injuries. Of this total, 826,000, or 12.3%, were attributed to moving motor vehicles.

Assuming that 12.3% of Virginia's compensation claims arose from traffic accidents, the total number of workmen injured by vehicles in 1980 was 3,483. Of these, 1,072 were explicitly designated as having been injured in motor vehicle accidents, leaving 2,411 injuries to be allocated between the residual categories of worker struck by object and worker struck against object. In 1980, a total of 7,117 injuries were classified under these two categories. There were 4,982 cases, 70% of the total, in which workers were struck by objects and 2,135 cases, 30% of the total, in which workers struck against objects. Applying these percentages to the estimated number of traffic-related work accidents, 2,411, yields the result that

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\*The difference between losses paid and losses incurred is accounted for by (1) administrative delays that cause some reimbursements to occur after the close of the calendar year, and (2) by legal delays as parties dispute the source and size of compensation.

1,688 workers were struck by motor vehicles and 723 struck against them. According to the supplementary data system, workers who were struck by objects received an average compensation of \$1,469, and those who struck against objects received \$1,146. Multiplying these averages by the estimated number of traffic-related injuries yields total costs of \$2,480,000 and \$828,000, respectively.

#### Uncompensated Wage Loss

According to section 65.1-54 of the Code of Virginia (1981), injured workmen are compensated at two-thirds of their wage. By adding lines 9, 10, and 11 of Table 1, one finds that \$5,567,000 in workmen's compensation were paid to those injured by automobiles. This figure represents, at most, two-thirds of the true loss caused by the accidents. The remaining one-third, \$2,783,000, represents an uncompensated wage loss.

The Code imposes a second uncompensated wage loss in that an injured worker cannot begin collecting benefits until eight days after the accident. Each January, the Virginia Employment Commission reports the average weekly wage that Virginia workers earned during the preceding year. For 1980, this figure was \$345. If one assumes that the injured workers earn the statewide average, one can estimate the uncompensated wage loss imposed during this first week of injury by multiplying the estimated number of workers injured in traffic accidents, 3,483, by the average weekly wage, \$345. The result is a loss of \$1,204,000.

The sum of these two forms of uncompensated wage loss appears on line 12. One must note that this estimate does not include the uncompensated wage loss borne by those who return to work within seven days of their injury.

#### Social Security Disability and Survivors' Payments

The Social Security Administration reported the following figures (Table 2) for disability payments to Virginians during the twelve months ending June 30, 1980.

The Social Security Administration estimated that 5.5% of work-related disabilities can be attributed to accidents. In Virginia, that 5.5% represents payments of \$15,565,000. The accident-caused disability figure must be discounted to eliminate accidents that were not caused by motor vehicles. To do this, the ratio of traffic-related work accidents to total work accidents was taken:  $(3,483 / 28,360 = 12.3\%)$  and applied to the \$15,565,000. The result was a social security disability payment of \$1,914,000 attributable to traffic accidents befalling Virginia workers.

Table 2

Social Security Disability and Survivors' Beneficiaries  
in Virginia by Type of Receipt and Amount of Benefits

— June 1979 to June 1980 —

	<u>Number of Recipients</u>	<u>Total Benefits</u>
Workers	66,074	\$283,000,000
Dependent Wives	21,682	2,604,000
Dependent Children	63,584	7,609,000
<b>Total</b>	<b>151,340</b>	<b>\$293,213,000</b>

Death statistics for resident males aged 24 to 64 provided the basis for attributing a portion of survivors' benefits to traffic fatalities. It was assumed that all claims for these benefits arose from deaths within this population. In 1980, total deaths within this group numbered 8,557. Of this total, 405 deaths, 4.6% of the total, were attributed to motor vehicle accidents. By applying this percentage to the \$10,213,000 of total survivors' benefits, one can attribute \$480,000 to traffic fatalities.

### Unarticulated Costs

The National Safety Council notes that two of the losses imposed by traffic accidents are extremely difficult to isolate and measure. Nonetheless, these losses can be directly attributed to the traffic safety problem, and they should be considered in determining public policy. First, traffic accidents impose a significant cost upon the taxpayer in the form of outlays for police, medical, and judicial services for accident victims. To estimate these costs would require one to unravel the budgets of these services and to attribute specific outlays to traffic safety. Second, traffic accidents impose business costs upon the employer of an injured employee, whether the accident occurs on or off the job. Injured employees impose costs in interrupted production and in necessitating a search for replacements. Many of these costs go unrecorded and are simply absorbed by the employer.

The final unarticulated loss that bears mention is composed of all the minor property damage that falls below deductible limits or is otherwise uncompensated. Few motorists have not had to bear these minor costs at one time or another, but the outlays are nearly impossible to measure.

## HUMAN COSTS OF VIRGINIA'S MOTOR VEHICLE ACCIDENTS

Thus far, the losses imposed by traffic accidents have been measured in strictly monetary terms. These losses can be measured a second way; in the pain and suffering borne by accident victims and their families. By emphasizing dollars and cents, one loses sight of the trauma and anguish associated with amputations, paralyses, or deaths wrought by traffic accidents. The human side of the traffic safety issue will be shown by viewing motor vehicle accidents in the context of other causes of death and injury, and by describing the severity and enormity of the injuries that commonly result from traffic accidents.

### Deaths from Motor Vehicle Accidents Compared to Other Causes of Death

Each year, the Virginia Bureau of Vital Statistics tabulates residents' deaths by cause and age. Overall, 42,496 Virginia residents died in 1980, and 1,081 of them died in motor vehicle accidents.\* As Table 3 shows, motor vehicle accidents were the sixth leading killer.

Table 3

#### Leading Causes of Virginia Residents' Deaths — 1980

<u>Rank</u>	<u>Causes</u>	<u>Number</u>
1	Cardiovascular disease other than stroke	16,862
2	Cancer	9,139
3	Stroke (cerebrovascular disease)	3,750
4	Pneumonia and influenza	1,149
5	Chronic obstructive pulmonary disease	1,130
6	MOTOR VEHICLE ACCIDENTS	1,081
7	Suicide	718
8	Diabetes mellitus	691
9	Chronic liver disease and cirrhosis	608
10	Conditions originating in perinatal blood	591
	Other causes	<u>6,777</u>
	All causes	42,496

\*The discrepancy between the 1,081 traffic deaths reported by the Bureau and the 1,045 reported in Crash Facts can be attributed to differences in methodology. The Bureau is concerned with residents' deaths regardless of where they occur. Consequently, they include Virginians killed in other states and exclude nonresidents' deaths within the state. Conversely, the Department of State Police is concerned with deaths within the state regardless of the residence of the deceased, and they adopt the opposite methodology. Their death toll, reported in Crash Facts, excludes Virginians killed in other states and includes nonresidents killed within the state. Since Tables 3, 4, and 5 are based on information from the Bureau, its estimate of 1,081 deaths is used.



The impact of deaths from motor vehicle accidents is brought into sharper focus when one disaggregates these causes of death into specific age groups. More Virginians between 10 and 34 were killed by motor vehicle accidents than by any other cause, and traffic accidents were a major cause of death for Virginians between the ages of 1 and 40. These findings are illustrated in Table 4. Because of their relatively young age, those killed in traffic accidents represent a major loss to future productivity.

Table 4  
Leading Causes of Virginians' Deaths by Age — 1980

<u>Age</u>	<u>Rank</u>	<u>Cause</u>	<u>Number</u>
0- 1	1	Conditions originating in perinatal blood	591
	2	Congenital anomalies	227
	3	Symptoms and ill-defined conditions	100
		MOTOR VEHICLE ACCIDENTS	4
		All causes	1,075
1- 4	1	Home accidents	38
	2	Congenital anomalies	25
	3	MOTOR VEHICLE ACCIDENTS	16
		All causes	166
5- 9	1	Cancer	21
	2	Motor vehicle accidents	16
	3	Home accidents	15
		All causes	94
10-14	1	MOTOR VEHICLE ACCIDENTS	29
	2	Cancer	19
	3	Home accidents	12
		All causes	114
15-19	1	MOTOR VEHICLE ACCIDENTS	206
	2	Suicide	45
	3	Cancer	29
		All causes	467
20-24	1	MOTOR VEHICLE ACCIDENTS	189
	2	Suicide	90
	3	Homicide and legal intervention	74
		All causes	570
25-29	1	MOTOR VEHICLE ACCIDENTS	135
	2	Homicide and legal intervention	94
	3	Suicide	80
		All causes	553
30-34	1	MOTOR VEHICLE ACCIDENTS	86
	2	Suicide	74
	3	Cancer	72
		All causes	520
35-39	1	Cancer	110
	2	Cardiovascular disease other than stroke	98
	3	MOTOR VEHICLE ACCIDENTS	56
		All causes	573
40 and above*	1	Cardiovascular disease other than stroke	15,482
	2	Cancer	8,794
	3	Stroke	3,687
		MOTOR VEHICLE ACCIDENTS	344
		All causes	38,364

\*Includes six cases where age was unknown.

A second useful way to illustrate the disproportionately young age of traffic accident victims is to present a percentage distribution of deaths by age. This is shown in Table 5, along with the percentage distribution of all deaths by age. The last two columns show what the first two columns would look like if deaths from crashes were completely eliminated. A cumulative distribution of these death figures, and tables with broader age categories, could be derived through appropriate aggregations of the data in Table 5.

Table 5

Numerical and Percentage Distribution on Virginians'  
Deaths by Age and Cause of Death — 1980

<u>Age</u>	<u>All Causes</u>		<u>Motor Vehicle Accidents</u>		<u>All Others</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent*</u>
0- 1	1,075	2.53	4	0.36	1,071	2.58
1- 4	166	0.39	16	1.47	150	0.36
5- 9	94	0.22	16	1.47	78	0.18
10-14	114	0.26	29	2.67	85	0.20
15-19	467	1.09	206	19.02	261	0.63
20-24	570	1.34	189	17.45	381	0.92
25-29	553	1.30	135	12.46	418	1.00
30-34	520	1.22	86	7.94	434	1.04
35-39	573	1.35	56	5.17	517	1.24
40-44	771	1.81	37	3.41	734	1.77
45-49	1,317	3.09	40	3.69	1,277	3.08
50-54	2,141	5.03	54	4.98	2,087	5.04
55-59	3,215	7.56	56	5.17	3,159	7.62
60-64	3,977	9.35	48	4.43	3,929	9.48
65-69	4,928	11.59	28	2.58	4,900	11.83
70-74	5,423	12.76	30	2.77	5,297	13.03
75-79	5,401	12.71	24	2.21	5,377	12.98
80-84	4,792	11.27	14	1.29	4,778	11.53
85+	6,393	15.04	13	1.20	6,380	15.40
Total	42,490		1,083		41,407	

NOTE: Figures are exclusive of deaths where age was unknown.

\*Cumulative percentage may not equal 100.00 due to rounding.

# INJURIES RESULTING FROM MOTOR VEHICLE ACCIDENTS COMPARED TO INJURIES FROM OTHER CAUSES

Crash Facts reports that 58,037 people were injured in motor vehicle accidents in Virginia during 1980. The sheer size of the number injured requires that comparisons be made on the basis of sampling estimates.

The University of Virginia Medical Center provided information on its emergency room traffic during the twelve months between July 1, 1979, and June 30, 1980. Its data are summarized in Table 6.

According to this sample, motor vehicle accidents account for 38.5% of all injuries that require emergency room treatment. Further, traffic accidents account for 5.3% of all emergency room admittances. The 5.3% would represent a large cost if these admittees required only an average amount of treatment; however, motor vehicle injuries, as will be seen below, are disproportionately severe and consume more emergency resources than their numbers would indicate. Comparisons among different causes of injury are severely hampered by the large numbers of unreported injuries that are treated at home or by private physicians.

Table 6

Admittees to U. Va. Med. Center Emergency Room by Type  
of Injury or Illness and Age  
July 1, 1979, to June 30, 1980

<u>Age</u>	<u>Injuries</u>					<u>Illnesses</u>	<u>Total</u>
	<u>Motor Vehicle</u>			<u>Other</u>	<u>Total</u>		
	<u>Automobile</u>	<u>Pedestrian</u>	<u>Motorcycle</u>				
0- 4	55	6	0	219	280	1,217	1,497
5-17	260	17	26	670	973	3,271	4,244
18-30	893	41	61	1,193	2,188	13,117	15,305
31-44	334	7	22	490	853	5,772	6,625
45-65	173	12	7	412	604	5,643	6,247
66+	74	3	1	250	328	3,047	3,375
Unknown	1	0	0	7	8	139	147
Total	1,790	86	117	3,181	5,174	32,266	37,440

## Motor Vehicle Injury Severity

Crash Facts classifies motor vehicle injuries (MVIs) into three categories, complaint of injury, slight visible injuries, and serious injuries. Table 7 shows the distribution of Virginia's MVIs for 1980, including the number of fatalities.

The classification system used in Crash Facts is somewhat subjective and is too vague to accurately describe the severity of Virginia's MVIs. In 1975, Hartunian, Smart, and Thompson\* performed an extensive analysis of national crash data to distribute MVIs by the more rigorous standards of the six-point abbreviated injury scale (AIS) used by the American Association of Automotive Medicine and the Society of Automotive Engineers and shown in Table 8. Hartunian, Smart and Thompson's results are summarized in Table 9.

The study went on to attribute treatment and process costs and the value of lost future earnings for MVIs by AIS code. These results are presented in Table 10. If one assumes that Hartunian, Smart, and Thompson's distribution describes the severity of Virginia's 1980 MVIs, one can estimate how many of Virginia's MVIs fall into each AIS code. This estimation is shown in Table 11.

Table 7

Crash Victims in Virginia by Type of Accident and Severity of Injury,  
Including Fatalities — 1980

	<u>Auto or Truck</u>	<u>Pedestrian</u>	<u>Motorcycle</u>	<u>Total*</u>
Crashes Involving Injury or Death	34,569	3,441	2,490	40,439
Injuries	51,617	2,559	2,953	58,037
Complaint of injury	18,716	759	309	19,778
Slight visible injury	11,143	97	1,804	13,027
Serious injury	21,371	1,643	829	24,778
Unknown and discrepancy	387	60	11	454
Fatalities	769	196	82	1,045
Total Injuries and Deaths	52,388	2,755	3,035	59,082

\*Row totals exceed entries in this column because some accidents are coded into more than one type.

\*Hartunian, N. S., Smart, C. N., and Thompson, M. S., "The Incidence and Economic Costs of Cancer, Motor Vehicle Injuries, Coronary Heart Disease, and Stroke: A Comparative Analysis," American Journal of Public Health, Vol. 70, No. 12, (December 1980).

Table 8

## Brief Descriptions and Examples of Injuries by AIS Code

AIS 1	Minor	Fractured nose
AIS 2	Moderate	Ruptured ear drum
AIS 3	Serious	Ruptured disc
AIS 4	Severe	Ruptured spleen
AIS 5	Critical	Lacerated aorta
AIS 6	Virtually unsurvivable	Crushed skull

Table 9

Number and Percentage of MVIs and  
Nonfatal MVIs by AIS Code — 1975

AIS CODE	Injuries		Nonfatal Injuries	
	Number	Percent	Number	Percent
1	3,053,035	71.49	3,053,035	72.25
2	702,923	16.46	702,923	16.64
3	353,569	8.27	353,569	8.37
4	87,262	2.04	87,262	2.06
5	28,611	0.66	28,611	0.68
6	44,995	1.05	---	----
Total	4,270,395	100.00	4,225,400	100.00

Virginia's experience differs from Hartunian's estimates. Applying the study's ratio of fatalities to injuries, Virginia should have expected 550 traffic deaths. Instead, the state experienced nearly twice that number. The disparity can be interpreted two ways: either the severity of all motor vehicle injuries has increased, or the increase in deaths clustered about those who previously would have received serious injury (AIS 4 or 5). In the present state of affairs, it is impossible to determine which hypothesis is correct.

As Table 10 reveals, a substantial share (46.2%) of the costs of nonfatal MVIs is attributable to the relatively few who suffer AIS 5 injuries. It is in this category where the human trauma of injury takes its starkest form, and it is to here that attention is turned.

Table 10

Estimated Direct and Indirect Costs of MVIs by  
AIS Code, Millions of Dollars — 1975

AIS Code	Direct Costs			Indirect Costs	Total
	Treatment During First Year	Future Treatment	Other	Lost Wages	
1	561	0	71	111	743
2	674	0	123	180	977
3	727	15	228	314	1,284
4	434	122	109	206	871
5	412	733	388	1,798	3,331
6	50	0	126	7,052	7,228
Total	2,858	870	1,045*	9,662	14,435

NOTE: Cost of lost wages and future treatment were discounted to present value at the rate of 6%.

\*Of this figure, \$878,000,000 represented legal costs.

Table 11

Expected Distribution of MVIs in Virginia  
by AIS Code — 1980

AIS Code	Expected Number of Virginians Injured 1980
1	41,932
2	9,655
3	4,856
4	1,198
5	393
Total	58,037

### Description of Severe MVIs

During the seven quarters between October 1, 1977, and June 30, 1979, Rimel\* collected data on patients admitted to the University of Virginia Medical Center with injuries to the central nervous system (brain and spinal cord). The patients were distributed as follows: head injury — 1,077, head and spinal injury — 120, spinal injury — 133. These figures translate into annual rates of 615, 69, and 76, respectively, for a total of 770 cases. Rimel reports that 58% of these patients' injuries resulted from road accidents. Applying this percentage to the annualized patient rolls implies that 358 head traumas, 40 head and spinal injuries, and 44 spinal injuries annually resulted from motor vehicle accidents.

To project Rimel's figures to the rest of the state, the Crash Facts were inspected for the fourteen counties and four cities served by the medical center. Table 12 duplicates Table 7 for the area considered in Rimel's study, and shows what percentage of Virginia's crash victims would be observed by Rimel.

Table 12

Crash Victims Served by U.Va. Med. Center by Type  
of Accident and Severity of Injury,  
Including Fatalities — 1980

	<u>Auto or Truck</u>	<u>Pedestrian</u>	<u>Motor- cycle</u>	<u>Total</u>
Crashes Involving Death or Injury	2,118 (6.13)	174 (5.06)	104 (4.34)	2,397 (5.93)
Injuries	3,241 (6.27)	174 (4.88)	121 (4.09)	3,532 (6.08)
Complaint of Injury	867 (4.63)	20 (2.63)	9 (2.91)	896 (4.53)
Slight Visible Injury	706 (6.33)	69 (6.28)	40 (4.97)	809 (6.21)
Serious Injury	1,647 (7.70)	85 (5.17)	72 (3.39)	1,806 (7.28)
Unknown and Discrepancy	21 (5.42)	0 (0.00)	0 (0.00)	21 (4.62)
Fatalities	84 (10.92)	13 (6.63)	5 (6.09)	101 (9.66)

NOTE: Numbers in parentheses show the number of victims as a percentage of comparable statewide figures.

\*Rimel, R. W., "A Prospective Study of Patients With Central Nervous System Trauma," Journal of Neurosurgical Nursing, Vol. 13, No. 1, 181 (June 1981).

To derive statewide injury figures from Rimel's data, it was noted that the area served by the medical center accounted for 7.3 of the serious MVIs. By multiplying the injuries found in the sample by the ratio between serious injuries statewide and serious injuries in the sample, one can project statewide injury tolls. The results of this projection are shown in Table 13, where it is indicated that over 6,000 Virginians suffer injuries to the central nervous system as a result of traffic accidents each year.

Rimel's study included a description of the posttreatment disposition of patients suffering central nervous system injuries. Five percent of the injured required further treatment in another hospital and 8% were transferred to rehabilitation facilities. These findings were applied to the projected statewide MVI estimates to obtain Table 14.

Table 13

MVIs in Rimel's Sample and in Virginia by Type  
of Injury — Projected 1980

	<u>Rimel's Sample</u>	<u>Virginia</u>
Head injury	358*	4,918
Head and spinal injury	40*	549
Spinal injury	44*	604
Total	442	6,071

\*Actual observations have been converted to annual rates.

Table 14

Virginia MVIs Requiring Further Treatment —  
Projected 1980

	<u>Another Hospital</u>	<u>Rehabilitation</u>
Head injury	246	393
Head and spinal injury	27	44
Spinal injury	30	48
Total	303	485



Many of those who require rehabilitative services are treated at state expense in the Woodrow Wilson Rehabilitation Center. Center personnel provided information on the number of MVI victims they treated during 1980 by type of injury. These results are presented in Table 15. Besides the human toll described in these figures, each of these cases represented a huge cost. As a point of reference, the Rehabilitation Institute of Chicago estimates that a 26-year-old paraplegic will require \$600,000 of care during his lifetime. Rimel and Hartunian et al. have shown that MVIs often befall low income individuals and the burden of their care often rests with the state.

Table 15

Patients Treated at Woodrow Wilson Rehabilitation Center  
by Cause of Injury and Type of Injury — 1980

<u>Type of Injury</u>	<u>MVIs Only</u>			<u>All Injuries</u>	<u>MVIs Percent All Injuries</u>
	<u>Auto</u>	<u>Motorcycle</u>	<u>Total</u>		
Paraplegia	19	8	27	81	33.3
Quadriplegia	42	7	49	135	36.3
Brain damage	84	9	93	156	59.6
Amputation	7	1	8	53	15.1
Muscle-joint injury	27	4	31	151	20.5
Total major effects	179	29	208	575	36.1
Epilepsy	1	0	1	77	0.1
Emotional disorder	3	0	3	300	1.0
Retardation	2	0	2	250	0.4
Visual defect	1	0	1	67	4.5
Chronic medical	1	0	1	67	1.5
Total effects	187	29	216	1,292	16.8

## MAJOR SOURCES OF DATA ON COSTS OF TRAFFIC ACCIDENTS

In anticipation that a traffic-loss data bank will be created, data sources that are updated annually are listed below.

1. Accident Facts, National Safety Council.
2. Crash Facts, Virginia Department of State Police.
3. Report on Property and Casualty Insurers Transacting Business in Virginia, Bureau of Insurance.
4. Supplementary Data System, Department of Labor and Industry: Research and Statistics.
5. National Health Survey, United States Public Health Service.
6. Social Security Administration Department of Research and Statistics (provides information on disability benefits upon telephone request at (301) 594-0387).
7. Resident Deaths by Age by Cause, Sex and Race, Virginia Bureau of Vital Statistics.
8. Emergency Room Traffic Report, University of Virginia Medical Center.
9. Patients Receiving Treatment by Type of Injury and Cause of Injury, Woodrow Wilson Rehabilitation Center.