Unit Costs of
Medium and Heavy Truck Crashes

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U.S. Department of Transportation
Federal Motor Carrier Safety Administration

March 2007

FOREWORD

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16. Abstract
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SI* (MODERN METRIC) CONVERSION FACTORS

Table of APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME	Note: Volumes greater than 1000 L shall be shown in m^3	
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE	Temperature is in exact degrees	
°F	Fahrenheit	5 × (F-32) ÷ 9 or (F-32) ÷ 1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		Force and Pressure or Stress		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

Table of APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE	Temperature is in exact degrees	
°C	Celsius	1.8C + 32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		Force & Pressure or Stress		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003, Section 508-accessible version September 2009)

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LIST OF ABBREVIATIONS AND SYMBOLS

Acronym	Definition
AIS	Abbreviated Injury Score
CDS	Crashworthiness Data System
DCI	Detailed Claims Information
FMCSA	Federal Motor Carrier Safety Administration
FARS	Fatality Analysis Reporting System
GES	General Estimate System
KABCOU	a rating scale defining injury severity
LTCCS	Large Truck Crash Causation Study
MAIS	Maximum Abbreviated Injury Score
NASS	National Accident Sampling System
NCCI	National Council on Compensation Insurance
NHTSA	National Highway Traffic Safety Administration
QALY	quality-adjusted life year
VSL	value of statistical life

EXECUTIVE SUMMARY

This study provides the latest estimates of unit costs for highway crashes involving medium/heavy trucks by severity. Based on the latest data available, the estimated cost of police-reported crashes involving trucks with a gross weight rating of more than 10,000 pounds averaged $91,112 (in 2005 dollars). These costs represent the present value, computed at a 4 percent discount rate, of all costs over the victims' expected life span that result from a crash. They include medically related costs, emergency services costs, property damage costs, lost productivity, and the monetized value of the pain, suffering, and quality of life that the family loses because of a death or injury.

Other notable findings include:

- Crashes in which truck-tractors with two or three trailers were involved were the rarest but their cost was the highest among all crashes—$289,549 per crash.
- Crashes in which straight trucks with no trailers were involved had the lowest cost—$56,296 per crash.
- The average cost of property-damage-only crashes was $15,114.
- The costs per non-fatal injury crash averaged $195,258.
- As expected, fatal crashes cost more than any other crashes. The average cost of fatal crashes was $3,604,518 per crash.
- The cost estimates exclude mental health care costs for crash victims, roadside furniture repair costs, cargo delays, earnings lost by family and friends caring for the injured, and the value of schoolwork lost.

INTRODUCTION

Safety analysts use crash cost data for a variety of purposes, from analyzing the effectiveness of a particular roadway enhancement to measuring the impact of seatbelt use. Crash costs are used to compare the relative efficacy of various crash countermeasures, which are expected to have a differential impact on crashes of different severity. These figures are also used to calculate and compare the cost-effectiveness of proposed safety regulations. Efficient allocation of research, enforcement, and analysis resources requires reliable data on crash costs.

Miller et al. (1991) made a first attempt to estimate truck and bus crash costs. They first computed costs by threat-to-life severity measured by Maximum Abbreviated Injury Score (MAIS; Association for the Advancement of Automotive Medicine, 1985). The AIS (Abbreviated Injury Score) scheme is a detailed medical classification developed by physicians as a basis for rating the survival threat injuries pose. It assigns a numeric rating ranging from 0 (uninjured) to 6 (maximum, generally unsurvivable). National Highway Traffic Safety Administration (NHTSA) data sets that are AIS coded add codes for "injured, severity unknown" and "unknown if injured." MAIS is simply the maximum AIS among the multiple injuries a victim suffers. The purpose of the AIS scale is to differentiate injuries by survival threat, not the cost, functional losses, or course of recovery they involve. For example, loss of teeth is an AIS-1 injury that can involve substantial costs and lifetime pain and suffering. Conversely, timely surgery often allows complete and rapid recovery from ruptured spleens and other AIS 3-5 internal injuries. Nevertheless, average costs per case within a body region almost always rise with MAIS (Miller, 1993).

By multiplying average costs per highway crash victim by MAIS times the MAIS distribution of victims in crashes sorted by the heaviest vehicle involved, Miller et al. (1991) estimated costs by vehicle type. Those estimates implicitly assumed that the distribution of injuries by body region within an AIS severity level did not vary with vehicle type. Only property damage and crash-related travel delay costs were tailored to truck and bus crashes.

Miller et al. (1998) and Miller, Spicer, et al. (1999) improved on Miller et al. (1991) by computing medium/heavy vehicle crash costs by vehicle type from 1982–1992 data on victim MAIS and body region in medium/heavy vehicle crashes. Zaloshnja, Miller, and Spicer (2000) paralleled their methods. It updated their estimates and substantially increased the number of cases used to estimate the injury distribution for occupants of light passenger vehicles involved in medium/heavy vehicle crashes. With the larger sample, it was able to more finely differentiate costs among heavy vehicle types. That study was the first to differentiate costs of single versus multiple trailer crashes.

Zaloshnja, Miller, and Spicer (2002) updated the results of Zaloshnja, Miller, and Spicer (2000) using methods described in Blincoe et al. (2002) and Zaloshnja, Miller, Romano, and Spicer (2004). Notably, costs per non-fatally-injured victim of a highway crash were estimated by MAIS, body part, and whether the victim suffered a fracture/dislocation. In addition to the more detailed diagnoses used in estimation, the accuracy of estimates was increased by using latest medical cost, wage, and income data. Property damage costs were updated using the latest insurance data on commercial vehicles. In estimating the productivity loss due to travel delays, it

was assumed that only police reported crashes delay traffic. This was based on the premise that any substantial impact on traffic would attract the attention of police.

This report provides costs per victim and per crash in of medium/heavy truck crashes stated in 2005 dollars. Differently from the previous report's estimates (Zaloshnja, Miller, & Spicer, 2004), which were based on the injury severity profile of truck crashes from the 1982–1986 period, the estimates presented in this report are based mainly on the injury severity profile from the 2001–2003 period. Within the constraints of available data, this study provides economically sophisticated, reliable estimates of the average costs of medium/heavy truck crashes with different levels of severity.

METHODS

Modeling crash injury costs requires estimates of the number of occupants involved in crashes, the medical details of each person's injuries, and the costs of those injuries and associated property damage and travel delay. No data system that contains a nationally representative sample of recent U.S. medium/heavy truck crashes and records medical descriptions of the injuries is available. NHTSA's National Accident Sampling System (NASS; NHTSA, 1987) collected data containing medical descriptions of injuries for a representative sample of all police-reported U.S. motor vehicle injury victims in 1982–1986. In 1988, NASS was replaced by two ongoing sampling systems. The Crashworthiness Data System (CDS) collects data similar to NASS. but focuses on crashes involving automobiles and automobile derivatives, light trucks and vans with gross vehicle weight less than 10,000 pounds (4,537 kg) that are towed due to damage. The General Estimates System (GES) collects data on a representative sample of all police-reported crashes, but the only injury description it gives is the severity that a police officer assigned in the police accident report. The 2001–2003 Large Truck Crash Causation Study (LTCCS) data provides the only sample of recent U.S. truck incidence data on crash injuries that records medical descriptions of the injuries, but to qualify for the LTCCS sample, a crash was to involve a large truck and at least one fatality that could be classified as "K" or injury that could be classified as "A" or "B" on the KABCOU scale (K = killed, A = incapacitating injury, B = non-incapacitating injury, C = possible injury, O = no injury, and U = injury, severity unknown). We used the 2001–2003 LTCCS data in this study to estimate injury costs for these crashes and the 1982–1986 NASS for the rest. To update the incidence of injury in less severe crashes, we adjusted the weights by truck type involved in crash, victim injury severity, and belt use, reflecting the incidence estimated from the 2001–2003 GES file.

Same as Zaloshnja, Miller, and Spicer (2002), we adopted unit costs from Zaloshnja Miller, Romano, and Spicer (2004) and Blincoe et al. (2002) to cost injuries in the 2001–2003 LTCCS and 1982–1986 NASS files. Those studies provide costs per victim in 2000 dollars by body part, whether or not a fracture/dislocation was involved, and AIS score. We updated the costs to 2005 dollars and merged them onto the crash files, calculating the comprehensive and economic costs per victim. Comprehensive costs represent the present value, computed at a 4 percent discount rate, of all injury-related costs that result from a crash over the victim's expected life span. We chose this discount rate in order to be consistent with NHTSA's and Federal Highway Administration's methodology. We included the following major categories of costs:

- Medically related.
- Emergency services.
- Lost productivity (wage and household work).
- The monetized value of pain, suffering, and lost quality of life.

Together, the literature calls these comprehensive costs. Economic costs exclude the last item.

Zaloshnja, Miller, Romano, and Spicer (2004) and Blincoe et al. (2002) medical cost estimates drew on data from 1992–1994 Civilian Health and Medical Program of the Uniformed Services data for physician and emergency department fees, 1994–1995 data on hospital costs in MD and

NY (the only two States where costs, not charges or payments were known), and 1987 National Medical Expenditure Survey and 1979–1987 National Council on Compensation Insurance (NCCI) data on the percentage of costs that occur more than 6 months post injury.

Zaloshnja, Miller, Romano and Spicer (2004) and Blincoe et al. (2002) based short-term productivity loss on information from the CDS 1988–1991 (for AIS85) and CDS 1993–1999 (for AIS90) about the probability an employed person would lose work for a specific injury and the 1993 Survey of Occupational Injury and Illness of the U.S. Bureau of Labor Statistics on the days of work lost per person who lost work. Mean probabilities of work loss were estimated from just those CDS records that had the relevant information, which frequently was missing. Sample size considerations drove the decision to pool several years of CDS data. Long-term productivity loss by diagnosis was based on 1979–1987 NCCI Detailed Claims Information (DCI) data on the probability that injuries would cause permanent partial/total disability and 1997 DCI data on the percentage loss of earning power for partially disabled injury victims.

Zaloshnja, Miller, Romano, and Spicer (2004) and Blincoe et al. (2002) included a variety of other direct costs. Among them were emergency services, insurance claims administration, legal and court costs, and workplace disruption costs. These estimates used insurance data and data from prior NHTSA studies.

Monetary losses associated with medical care, other resources used, and lost work do not fully capture the burden of injuries. Injuries also cost victims and families by reducing their quality of life. The good health lost when someone suffers a health problem or dies can be accounted for by estimating quality-adjusted life years (QALYs) lost. A QALY is a health outcome measure that assigns a value of 1 to a year of perfect health and 0 to death (Gold et al., 1996). QALY loss is determined by the duration and severity of the health problem. To compute it, following Miller (1993), Zaloshnja, Miller, Romano, and Spicer (2004) and Blincoe et al. (2002) used diagnosis and age-group specific estimates from Miller et al. (1995) of the fraction of perfect health lost during each year that a victim is recovering from a health problem or living with a residual disability. Such an impairment fraction was estimated by body part, AIS, and fracture/dislocation. Following the guidance of the Office of the Secretary of Transportation (2002) on the value of statistical life, the monetary value of a QALY ($119,487) was derived by subtracting lost productivity from the Value of Statistical Life (VSL: $3 million) and then dividing by the number of years in the occupant's life span. To avoid the variability that comes from age and gender differences of people involved in different crashes, in this report, differently from Zaloshnja, Miller, and Spicer (2002), we calculated occupants' life span based on the median age of the U.S. population in 2005 (36.4). In addition to the monetary value per QALY used in this study, we present values based on VSL greater that $3 million, which can easily be applied to our estimates if the VSL is increased in the future.

Travel delay and property damage costs were updated directly from Zaloshnja, Miller, and Spicer (2002) using the wage index for the first and the consumer price index for the second.

RESULTS

Table 1 presents the annual number of victims and cost per victim by truck type involved in the crash and police-reported injury severity. The highest costs per victim are for fatalities (over $3 million) because they include the VSL. Excluding fatalities, the highest cost per victim is for incapacitating injury in crashes involving truck-tractor with two to three trailers ($783,017).

Table 2 presents the annual number of crashes, the average number of victims and costs per crash by truck type involved in the crash and maximum police-reported injury severity. Again, the most costly crashes are fatal crashes (over $3 million). Excluding fatal crashes, the most expensive crashes are those involving truck-tractor with two to three trailers in which at least one victim had an incapacitating injury ($1,291,936)

Table 3 presents the estimated costs per crash for all crashes; and Table 4 presents the estimated costs per crash for injury crashes only. The $289,549 average cost per crash for vehicles with two or three trailers far exceeds the $97,574 for a tractor-trailer crash. In average, the total cost per large truck crash reported here is 53 percent higher than that reported in Zaloshnja, Miller, and Spicer (2002). Nearly half of this increase can be explained by the different dollar years used—from 2000 to 2005, the medical expenditure index rose 40 percent, the wage index rose 20 percent, and the consumer price index rose 13 percent. The remaining increase can be mainly explained by the change in the injury severity profile (the average number of people involved in a crash was only slightly increased—from 1.21 to 1.25). As mentioned earlier, Zaloshnja, Miller, and Spicer based cost estimates on the injury severity profile of truck crashes in the 1982–1986 NASS file, whereas the estimates presented in this report are based mainly on the injury severity profile in the 2001–2003 LTCCS file.

Table 5 presents different values based on VSL from $3 million to $7 million. These values can be easily multiplied by the QALYs presented in previous tables, if the VSL is increased in the future.

Table 1. Costs per Medium/Heavy Truck Crash Victim by Truck Type Involved in Crash and Police-Reported Injury Severity, 2001–2003 (in 2005 dollars)

Truck Type Involved in Crash	Injury Severity	Annual Number of Victims*	Medical Costs	Emerg-ency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL $3 Million	Total Cost per Victim	QALYs
Straight truck, no trailer	O – No injury	140,783	117	42	1,483	1,702	2,576	542	4,759	0.0045
	C – Possible injury	21,126	5,938	152	2,891	3,903	19,217	22,628	50,828	0.1894
	B – Non-incapacitating injury	6,998	28,981	185	4,685	4,974	65,062	82,686	181,598	0.692
	A – Incapacitating injury	3,526	38,655	281	6,118	4,914	111,133	143,365	299,551	1.1998
	K – Killed	1,098	30,916	989	14,919	6,143	916,141	2,083,859	3,046,823	17.44
	U – Injury, severity unknown	2,059	4,116	190	3,350	3,737	9,434	10,420	27,509	0.087
	Unknown if injured	9,008	918	114	2,303	3,454	5,528	2,570	11,433	0.022
Straight truck w/ trailer	O – No injury	13,803	437	42	2,097	1,795	2,626	760	5,963	0.0064
	C – Possible injury	3,324	7,680	185	5,676	4,150	22,874	26,895	63,310	0.2251
	B – Non-incapacitating injury	765	11,164	138	6,956	4,507	57,376	56,141	131,774	0.4698
	A – Incapacitating injury	820	30,880	319	8,477	4,768	115,872	113,361	268,910	0.9487
	K – Killed	162	30,916	989	21,258	6,143	916,141	2,083,859	3,053,163	17.44
	U – Injury, severity unknown	306	6,561	214	5,900	2,924	50,954	31,216	94,845	0.2612
	Unknown if injured	1,282	956	83	3,004	1,878	4,081	3,851	11,975	0.0322
Bobtail	O – No injury	10,706	409	43	2,015	2,223	3,164	897	6,528	0.0075
	C – Possible injury	2,690	7,389	155	3,894	4,589	21,649	22,619	55,707	0.1893
	B – Non-incapacitating injury	405	18,822	283	6,402	5,042	67,831	117,932	211,270	0.987
	A – Incapacitating injury	1,192	29,815	396	8,389	5,042	109,289	206,195	354,083	1.7257
	K – Killed	38	30,916	989	20,403	6,143	916,141	2,083,859	3,052,308	17.44
	U – Injury, severity unknown	344	373	163	4,496	1,937	2,710	931	8,672	0.0078
	Unknown if injured	876	1,050	75	3,166	1,923	3,626	3,047	10,964	0.0255
Truck-Tractor, 1 trailer	O – No injury	215,614	485	43	2,313	1,794	2,828	781	6,451	0.0065
	C – Possible injury	29,283	8,831	187	6,274	4,109	23,473	32,742	71,508	0.274
	B – Non-incapacitating injury	27,240	13,347	150	7,708	4,477	46,655	52,854	120,713	0.4423
	A – Incapacitating injury	14,529	33,931	264	9,314	4,740	104,494	134,262	282,264	1.1236
	K – Killed	3,296	30,916	989	23,509	6,143	916,141	2,083,859	3,055,413	17.44

Truck Type Involved in Crash	Injury Severity	Annual Number of Victims*	Medical Costs	Emerg-ency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL $3 Million	Total Cost per Victim	QALYs
	U – Injury, severity unknown	1,172	3,741	85	4,601	3,036	8,178	4,696	21,302	0.0393
	Unknown if injured	13,843	2,122	92	3,381	1,891	12,303	11,479	29,377	0.0961
Truck-Tractor, 2 or 3 trailers	O – No injury	5,593	719	46	6,673	1,844	2,884	1,017	11,339	0.009
	C – Possible injury	1,064	6,748	164	17,877	4,138	28,666	31,709	85,164	0.265
	B – Non-incapacitating injury	939	12,701	163	21,713	4,451	50,364	44,632	129,573	0.3735
	A – Incapacitating injury	1,603	92,651	445	26,294	4,751	279,210	384,417	783,017	3.2172
	K – Killed	214	30,916	989	66,336	6,143	916,141	2,083,859	3,098,241	17.44
	U – Injury, severity unknown	28	92,425	249	10,102	1,880	212,213	266,103	581,091	2.227
	Unknown if injured	456	1,027	88	6,744	2,051	6,933	2,977	17,770	0.0249
Unknown medium/heavy truck	O – No injury	4,486	2	39	2,106	1,600	1,885	6	4,038	0.00005
	C – Possible injury	482	4,376	217	5,793	3,471	9,263	13,751	33,401	0.1151
	B – Non-incapacitating injury	259	37,507	137	7,135	4,905	88,753	95,444	228,977	0.7988
	A – Incapacitating injury	–	–	–	–	–	–	–	–	–
	K – Killed	90	30,916	989	21,981	6,143	916,141	2,083,859	3,053,885	17.44
	U – Injury, severity unknown	123	5,338	244	3,073	4,538	11,601	29,070	49,327	0.2433
	Unknown if injured	1,971	1,034	76	2,783	1,954	3,657	3,015	10,565	0.0252
All medium/ heavy trucks	O – No injury	390,986	347	43	2,058	1,771	2,729	692	5,869	0.0058
	C – Possible injury	57,971	7,569	173	5,106	4,054	21,780	28,075	62,702	0.235
	B – Non-incapacitating injury	36,606	16,505	158	7,455	4,581	51,025	59,436	134,579	0.4974
	A – Incapacitating injury	21,670	38,700	289	9,967	4,787	119,191	157,410	325,557	1.3174
	K – Killed	4,898	30,916	989	23,328	6,143	916,141	2,083,859	3,055,232	17.44
	U – Injury, severity unknown	4,033	4,530	161	4,044	3,329	13,137	11,887	33,759	0.0995
	Unknown if injured	27,435	1,542	97	3,015	2,412	8,707	7,179	20,540	0.0601
	All people involved in medium/ heavy truck crashes	**543,598**	**4,101**	**86**	**3,317**	**2,407**	**21,265**	**32,996**	**64,172**	**0.2761**

* Annual number of fatal victims estimated from 2001–2003 Fatality Analysis Reporting System (FARS), annual number of victims involved in crashes with maximum severity not A, B, or K estimated from 2001–2003 GES 2001–2003, and the rest from 2001–2003 LTCCS.

Table 2. Costs per Medium/Heavy Truck Crash by Truck Type Involved in Crash and Police-Reported Maximum Injury Severity, 2001–2003 (in 2005 dollars)

Truck Type Involved in Crash	Maximum Injury Severity	Annual Number of Victims*	Avg. No. People Involved in Crash	Medical Costs	Emer-gency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL $3 Million	Total Cost per Crash	QALYs
Straight truck, no trailer	O – No injury	116,476	1.24	253	132	4,730	5,417	7,431	740	13,286	0.0062
	C – Possible injury	17,491	1.59	8,396	399	8,404	10,656	24,673	20,493	62,364	0.1715
	B – Non-incapacitating injury	4,665	1.51	15,903	203	7,482	8,337	86,964	87,673	198,225	0.7337
	A – Incapacitating injury	2,612	1.59	84,052	603	11,139	10,411	223,154	321,546	640,494	2.691
	K – Killed	1,016	1.61	48,893	1,149	19,676	11,409	962,119	2,104,573	3,136,409	17.6134
	U – Injury, severity unknown	527	1.40	5,398	377	8,232	9,083	18,804	11,496	44,307	0.0962
	Unknown if injured	7,245	1.34	1,286	234	5,632	7,735	11,786	3,176	22,114	0.0266
Straight truck w/ trailer	O – No injury	12,502	1.21	1,272	140	6,740	5,763	7,870	1,273	17,295	0.0107
	C – Possible injury	1,359	1.59	13,681	475	14,852	11,384	28,075	34,447	91,530	0.2883
	B – Non-incapacitating injury	517	1.49	14,110	279	17,084	12,706	96,369	92,597	220,440	0.775
	A – Incapacitating injury		2.10	34,573	507	16,138	10,772	181,926	130,292	363,436	1.0904
	K – Killed	162	1.73	58,694	1,089	25,788	10,028	932,569	2,124,691	3,142,831	17.7817
	U – Injury, severity unknown	20	2.25	2,230	375	18,028	11,502	19,347	6,011	45,990	0.0503
	Unknown if injured	1,277	1.15	2,053	186	7,623	5,664	9,419	4,116	23,396	0.0344
Bobtail	O – No injury	9,843	1.25	984	132	6,332	6,892	9,598	2,042	19,089	0.0171
	C – Possible injury	1,269	1.59	8,015	363	11,459	13,246	27,778	16,709	64,324	0.1398
	B – Non-incapacitating injury	266	1.60	10,835	197	9,936	9,273	96,472	56,066	173,507	0.4692
	A – Incapacitating injury	858	1.58	36,300	500	9,985	8,127	117,368	217,195	381,348	1.8177
	K – Killed	37	1.45	39,249	1,126	26,663	12,430	971,748	2,133,782	3,172,568	17.8578
	U – Injury, severity unknown	59	1.04	1,414	278	8,828	6,269	9,398	3,005	22,923	0.0251
	Unknown if injured	786	1.14	1,586	158	7,484	5,915	9,402	3,770	22,401	0.0316
Truck-Tractor, 1 trailer	O – No injury	179,181	1.12	1,119	120	6,493	5,024	6,867	1,151	15,749	0.0096
	C – Possible injury	19,461	1.53	13,010	460	15,410	10,506	26,590	35,489	90,959	0.297
	B – Non-incapacitating injury	17,688	1.49	15,828	205	12,832	7,909	75,649	67,197	171,710	0.5624
	A – Incapacitating injury	10,843	1.57	53,003	510	16,329	9,528	152,532	215,471	437,845	1.8033
	K – Killed	2,825	1.58	81,335	1,495	39,366	14,941	1,200,333	2,511,192	3,833,721	21.0164

Truck Type Involved in Crash	Maximum Injury Severity	Annual Number of Victims*	Avg. No. People Involved in Crash	Medical Costs	Emer-gency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL $3 Million	Total Cost per Crash	QALYs
	U – Injury, severity unknown	413	1.19	5,425	195	10,329	7,042	12,998	4,450	33,397	0.0372
	Unknown if injured	10,191	1.49	2,131	196	8,997	6,079	9,685	3,929	24,939	0.0329
Truck-Tractor, 2 or 3 trailers	O – No injury	4,976	1.03	1,059	111	16,350	4,568	6,280	1,084	24,883	0.0091
	C – Possible injury	740	1.49	12,207	465	44,308	10,971	26,400	33,541	116,920	0.2807
	B – Non-incapacitating injury	559	1.32	11,766	252	48,302	10,609	90,780	92,984	244,084	0.7782
	A – Incapacitating injury	1,129	1.26	140,004	828	58,279	11,729	458,351	634,474	1,291,936	5.31
	K – Killed	150	1.50	61,309	1,295	98,318	12,726	1,001,712	2,190,118	3,352,753	18.3293
	U – Injury, severity unknown	–	–	–	–	–	–	–	–	–	–
	Unknown if injured	420	1.09	1,681	191	17,889	5,214	8,114	2,998	30,872	0.0251
Unknown medium/heavy truck	O – No injury	3,143	1.05	18	87	4,525	3,616	4,305	1,136	10,072	0.0095
	C – Possible injury	455	1.47	7,804	525	15,710	9,979	22,347	32,056	78,442	0.2683
	B – Non-incapacitating injury	259	1.30	37,507	192	10,468	7,542	91,716	95,444	235,327	0.7988
	A – Incapacitating injury	–	–	–	–	–	–	–	–	–	–
	K – Killed	87	1.04	30,916	1,025	24,238	7,921	918,136	2,131,653	3,105,969	17.84
	U – Injury, severity unknown	6	3.39	5,742	386	7,685	8,492	18,113	2,808	34,734	0.0235
	Unknown if injured	1,767	1.49	1,335	199	8,435	6,183	9,433	33	19,435	0.0003
All medium/ heavy trucks	O – No injury	326,121	1.17	800	125	5,999	5,228	7,156	1,035	15,114	0.0087
	C – Possible injury	40,774	1.56	10,825	432	12,791	10,687	25,803	28,363	78,215	0.2374
	B – Non-incapacitating injury	23,955	1.49	15,890	207	12,652	8,170	79,058	72,516	180,323	0.6069
	A – Incapacitating injury	16,035	1.57	62,608	547	18,090	9,798	184,769	259,175	525,189	2.1691
	K – Killed	4,278	1.58	70,678	1,378	35,828	13,674	1,118,922	2,377,711	3,604,518	19.8993
	U – Injury, severity unknown	1,024	1.32	5,121	298	9,301	8,143	15,929	8,012	38,661	0.0671
	Unknown if injured	21,685	1.40	1,751	207	7,863	6,594	10,310	3,347	23,479	0.028
	All medium/ heavy truck crashes	**433,872**	**1.25**	**5,606**	**191**	**7,847**	**6,231**	**30,582**	**40,655**	**91,112**	**0.3402**

* Annual number of fatal crashes estimated from 2001–2003 FARS, annual number of crashes with maximum severity not A, B, or K estimated from 2001–2003 GES 2001–2003, and the rest from 2001–2003 LTCCS.

Table 3. Costs per Crash by Truck Type Involved in Crash, 2001–2003 (in 2005 dollars)

Truck crash type	Annual Number of Crashes*	Medical Costs	Emer-gency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL=$3 Million	Total Cost per Crash	QALYs
Straight truck, no trailer	150,032	3,545	186	5,512	6,371	22,385	25,735	56,296	0.2154
Straight truck with trailer	16,430	4,535	198	8,346	6,668	27,862	32,691	71,758	0.2736
Bobtail	13,118	4,320	185	7,279	7,590	22,900	24,816	58,055	0.2077
Truck-tractor, 1 trailer	240,601	6,492	191	8,622	6,047	34,228	48,041	97,574	0.4021
Truck-tractor, 2 or 3 trailers	7,974	23,680	281	28,746	6,788	96,917	141,549	289,549	1.1846
Unknown medium/heavy truck	5,717	3,219	176	7,196	5,164	25,171	39,868	63,343	0.3337
All medium/heavy trucks	433,872	5,606	191	7,847	6,231	30,582	40,655	91,112	0.3402

* Annual number of fatal crashes estimated from 2001-03 FARS, annual number of crashes with maximum severity not A, B, or K estimated from 2001-03 GES 2001-03, and the rest from 2001-03 LTCCS.

Table 4. Costs per Injury Crash (Max Injury: A, B, C, or U) by Truck Type Involved in Crash, 2001-2003 (in 2005 dollars)

Truck crash type	Annual Number of Crashes*	Medical Costs	Emer-gency Services	Property Damage	Lost Produc-tivity from Delays	Total Lost Produc-tivity	Monetized QALYs Based on VSL=$3 Million	Total Cost per Crash	QALYs
Straight truck, no trailer	25,294	17,530	383	8,513	10,170	56,534	63,781	146,741	0.5338
Straight truck with trailer	2,490	18,666	441	15,648	11,513	78,917	69,175	182,847	0.5789
Bobtail	2,452	18,057	391	10,715	10,857	66,138	90,783	186,084	0.7598
Truck-tractor, 1 trailer	48,404	22,934	376	14,630	9,308	72,612	87,127	197,679	0.7292
Truck-tractor, 2 or 3 trailers	2,428	71,516	585	51,722	11,240	242,026	326,586	692,435	2.7332
Unknown medium/heavy truck	720	18,481	404	13,761	9,090	47,286	54,650	134,583	0.4574
All medium/heavy trucks	81,789	22,389	387	13,745	9,744	72,444	86,292	195,258	0.7222

* Annual number of crashes with maximum severity not A or B estimated from 2001-03 GES 2001-03 and the rest from 2001-03 LTCCS.

Table 5. Value of a QALY Based on Different Values of Statistical Life (in 2005 dollars)

VSL	Value of QALY
$3 million	**119,487**
$3.25 million	134,542
$3.5 million	149,598
$3.75 million	164,653
$4 million	**179,708**
$4.25 million	194,763
$4.5 million	209,818
$4.75 million	224,874
$5 million	**239,929**
$5.25 million	254,984
$5.5 million	270,039
$5.75 million	285,094
$6 million	**300,150**
$6.25 million	315,205
$6.5 million	330,260
$6.75 million	345,315
$7 million	**360,370**

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