

SOCIETAL COSTS OF TRAFFIC CRASHES AND CRIME IN MICHIGAN: 2006 UPDATE

**LIDIA P. KOSTYNIUK
LINDA L. MILLER
LISA J. MOLNAR
ADAM D. NATION**



UMTRI

**UNIVERSITY OF MICHIGAN
TRANSPORTATION RESEARCH INSTITUTE**

Technical Report Documentation Page

1. Report No. UMTRI-2006-23		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Societal Costs of Traffic Crashes and Crime in Michigan: 2006 Update				5. Report Date Sept 12, 2006	
				6. Performing Organization Code	
7. Author(s) Kostyniuk, L.P., Miller, L.L., Molnar, L.J., Nation, A.D				8. Performing Organization Report No. UMTRI-2006-23	
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.				10. Work Unit no. (TRAIS)	
				11. Contract or Grant No. CP-06-03	
12. Sponsoring Agency Name and Address Michigan Office of Highway Safety Planning 4000 Collins Road Lansing MI, 48909-8133				13. Type of Report and Period Covered Final 10/1/05-9/30/06	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract <p>Cost estimates, including both monetary and nonmonetary quality-of-life costs specific to Michigan, were estimated for traffic crashes and index crimes by experts in the field of economics of traffic crashes and crimes. These cost estimates were applied to 2004 Michigan traffic crash and index crime incidence data to estimate dollar losses from traffic crashes and index crimes to the state and for each county within the state. Crash costs associated with alcohol-involved traffic crashes were also calculated. Findings indicate that in 2004, index crimes in Michigan resulted in \$2.0 billion in monetary costs and \$5.1 billion in total (monetary and nonmonetary quality-of-life) costs. Traffic crashes resulted in \$5.9 billion in monetary costs and \$12.4 billion in total costs. Of these costs, alcohol-involved crashes accounted for \$1 billion in monetary costs and \$2.6 billion in total costs. Based on dollar losses to the state, the magnitude of the problem of traffic crashes exceeded that of index crimes in 2004.</p>					
17. Key Words				18. Distribution Statement Unlimited	
19. Security Classification (of this report) Unclassified		20. Security Classification (of this page) Unclassified		21. No. of Pages 196	22. Price

Background

Traffic crashes and crime both impose significant economic and social burdens through injury and loss of life, as well as property damage and loss. Efforts to reduce crashes and crime often result in competing demands on limited public resources. Comparable and up-to-date cost data on crashes and crime contribute to informed decision making about allocation of limited public resources in important ways. As a first step, cost data provide information about the magnitude of the problems of crashes and crime by allowing us to estimate dollar losses to society. More importantly, cost data on crashes and crime are essential in providing a common measure for evaluating cost and benefits of various policy alternatives that compete for resources.

This document is the fourth in a series of UMTRI reports that estimates the monetary and nonmonetary (quality-of-life) costs to the state of Michigan from traffic crashes and crimes. In all four studies, cost estimates for crashes and crime were applied to crash and crime incident data to generate dollar losses to the state. Michigan's crime experience in these studies is represented by the incidence of index crimes. Index crimes include murder, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson. Arson, however, was excluded from these studies because it is often intentionally committed against one's own property complicating societal cost estimation.

The results of the first study (Streff and Molnar, 1990) indicated that in 1988, index crimes in Michigan resulted in \$0.8 billion in monetary costs and \$2.4 billion in total costs (i.e., monetary and nonmonetary quality-of-life costs). Traffic crashes in Michigan resulted in \$2.3 billion in monetary costs and \$7.1 billion in total costs, nearly three times the cost of index crimes. In 1994, updated cost estimates for crashes and crime applied to 1993 crash and crime incidence data for Michigan (Streff and Molnar, 1994) indicated that index crimes resulted in \$1.9 billion in monetary costs and \$5.0 billion in total costs, while traffic crashes resulted in \$4.5 billion in monetary costs and \$12.1 billion in total costs in 1993, more than twice the cost of index crimes.

In the third study (Streff and Molnar, 1999), the study methodology was expanded to include cost estimates for alcohol-involved traffic crashes. Findings indicated that in 1998, index crimes in Michigan resulted in \$1.9 billion in monetary costs and \$4.5 billion in total costs. Traffic crashes resulted in \$4.3 billion in monetary costs and \$10.7 billion in total costs. Of those costs, alcohol-involved crashes

accounted for \$1 billion in monetary costs and 2.8 billion in total costs. Costs for traffic crashes in 1998 were more than twice as high as comparable costs for index crimes.

In the present study, cost estimates, including both monetary and nonmonetary quality-of-life costs specific to Michigan, were generated for traffic crashes and index crimes by leading experts in the fields of economics of traffic crashes and crime. As in the three earlier studies, arson was excluded from the analyses. The cost estimates were applied to 2004 Michigan traffic crash and index crime incidence data to estimate dollar losses from traffic crashes, alcohol-related traffic crashes, and index crimes for each county in the state, as well as for the state as a whole.

Methods

Estimation of Costs for Traffic Crashes and Index Crimes

Methods for estimating costs of traffic crashes and index crimes are detailed in the Appendix. A brief overview is presented here. Costs of traffic crashes and index crimes were estimated by the Pacific Institute for Research and Evaluation. Costs of traffic crashes parallel those estimated by Miller, Galbraith, Leslina, Schlax, Mabery, and Deering (1997). Methods for estimating costs of index crimes parallel those used by Miller, Cohen, and Wiersema (1994). Costs of both traffic crashes and index crimes were adapted to Michigan using state-specific medical costs and earnings and a regional price adjuster.

Costs of traffic crashes and index crimes are broken out into two categories in this study: (1) monetary costs and (2) nonmonetary quality-of-life costs. Monetary costs include medical care (including payments for hospitals and physician care, emergency medical transport, rehabilitation, prescriptions, allied health services, medical devices, nursing home care, and insurance claims processing, as well as coroner and premature burial costs for fatalities), future earnings (including wages, fringe benefits, and housework lost by the injured), public services (including initial police response and follow-up investigation, as well as emergency transport and fire services), and property damage and loss (the value of property damage and of property taken and not recovered).

Nonmonetary quality-of-life costs include costs associated with pain, suffering, and fear. For crime, these values come from jury awards for pain, suffering, and lost quality of life due to physical injuries and fear. For murders and traffic crashes, these values are computed from the amount people routinely spend (in dollars or time) to reduce their risk of death and injury (see Cohen and Miller 1994; Cohen and Miller, 2003).

Estimation of Incidents of Traffic Crashes and Index Crimes

Data on motor vehicle crashes in Michigan were obtained from the Michigan State Police and were broken out by county (UMTRI, 2005). Records were obtained for all crashes reported to local or state police agencies in 2004, with injury severity coded according to the KABCO injury severity scale. K-level (fatal) injuries are injuries caused

by the crash that result in death within 90 days of the incident. A-level (serious) injuries are incapacitating injuries that prevent injured persons from walking, driving, or normally continuing activities they were capable of performing prior to the injury. B-level (moderate) injuries include non-incapacitating injuries that are evident to observers at the scene of the crash. C-level (minor) injuries are possible injuries reported or claimed that are not fatal, incapacitating, or non-incapacitating injuries evident to observers. 0-level (no injury) refers to property-damage-only incidents in which no occupants were injured. Alcohol-involved crashes were identified as those in which the reporting officer checked the HBD or had-been-drinking box on the crash report form.

Data on index crimes for 2004 were obtained from Michigan's Uniform Crime Reporting Program operated by the Michigan State Police and were broken out by county. Index crimes used in the analyses include murder, rape, robbery, assault, burglary, larceny, and motor vehicle theft.

Estimation of Dollar Losses to the State of Michigan from Traffic Crashes and Index Crimes

Cost estimates for traffic crashes and index crimes were applied to 2004 Michigan crash and index crime incidence data to estimate dollar losses for each county in the state, as well as for the state as a whole. Total incidence frequencies for traffic crash outcomes were generated based on the number of occupants killed or injured (KABC), as well as the number of vehicles involved in crashes in which no occupants were injured (property damage only). These frequencies were multiplied by appropriate cost figures to generate costs for each crash outcome category, then summed to generate the monetary and total costs for traffic crashes. The same procedure was followed independently for alcohol-involved crashes. Frequencies for each index crime were multiplied by appropriate cost figures to generate costs for each index crime category, then summed to generate the monetary and total costs for index crimes.

Results

Table 1 presents cost estimates per police-reported crash victim in Michigan in 2004 dollars. Cost estimates are broken out by crash outcome and cost category. Table 2 presents cost estimates per police-reported, alcohol-involved crash victim in Michigan in 2004 dollars (with cost estimates broken out by crash outcome and cost category). Table

3 presents cost estimates per police-reported index crime victim in Michigan in 2004 dollars (with cost estimates broken out by crime category and cost category). Within each crash or crime category in Tables 1-3, total comprehensive costs may not exactly add to the sum of monetary and quality-of-life costs due to computer rounding.

	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only
Medical Care	\$28,926	\$24,366	\$6,896	\$5,150	\$164
Future Earnings (Lost Wages)	\$1,443,491	\$63,292	\$16,788	\$12,298	\$549
Public Services	\$895	\$190	\$123	\$106	\$33
Property Damage & Loss	\$11,033	\$5,986	\$4,562	\$4,453	\$1,594
Subtotal (Monetary Cost)	\$1,484,344	\$93,833	\$28,369	\$22,007	\$2,339
Quality of Life	\$2,692,099	\$118,019	\$31,596	\$18,689	\$585
Total (Comprehensive Cost)	\$4,176,443	\$211,852	\$59,965	\$40,695	\$2,924

	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only
Medical Care	\$28,926	\$40,135	\$10,965	\$5,676	\$256
Future Earnings (Lost Wages)	\$1,511,242	\$107,124	\$23,025	\$11,507	\$1,050
Public Services	\$895	\$266	\$141	\$107	\$33
Property Damage & Loss	\$11,033	\$7,501	\$4,774	\$4,451	\$1,594
Subtotal (Monetary Cost)	\$1,552,095	\$155,027	\$38,905	\$21,742	\$2,933
Quality of Life	\$2,826,704	\$161,025	\$47,910	\$18,921	\$883
Total (Comprehensive Cost)	\$4,378,799	\$316,051	\$86,815	\$40,663	\$3,816

	Murder	Rape	Assault	Robbery	Larceny	Burglary	Motor Vehicle Theft
Medical Care	\$33,667	\$1,627	\$650	\$1,984	\$0	\$0	\$0
Future Earnings (Lost Wages)	\$1,487,425	\$5,146	\$1,677	\$2,424	\$25	\$31	\$91
Public Services	\$2,541	\$658	\$284	\$388	\$450	\$394	\$280
Property Damage & Loss	\$1,558	\$132	\$68	\$1,136	\$930	\$2,548	\$6,387
Subtotal (Monetary Cost)	\$1,525,191	\$7,562	\$2,679	\$5,932	\$1,404	\$2,974	\$6,758
Quality of Life	\$2,636,417	\$162,530	\$10,530	\$12,225	\$0	\$404	\$367
Total (Comprehensive Cost)	\$4,161,609	\$170,092	\$13,209	\$18,157	\$1,404	\$3,377	\$7,126

Estimates of traffic crash and index crime incidence and cost estimates by crash outcome (for both total crashes and alcohol-involved crashes) and crime category for the state of Michigan as a whole and for all Michigan counties are contained in figures and

tables on the following pages. To be consistent with the previous reports in this series, the average cost of traffic crash costs per casualty is also shown. The term "casualty" is used in the general sense, and refers to victims in injury crashes and vehicles in PDO crashes. Also presented are tables of cost estimates for traffic crashes and index crimes broken out by specific cost categories. Within each crash or crime category, total comprehensive costs were calculated by multiplying the cost of each incident type by the number of such incidents. Because of computer rounding, these total comprehensive costs may not exactly add to the sum of monetary and quality-of-life costs.

In 2004, index crimes in Michigan resulted in \$2.0 billion in monetary costs and \$5.1 billion in total costs (i.e., monetary and nonmonetary quality-of-life costs). Traffic crashes in Michigan resulted in \$5.9 billion in monetary costs and \$12.4 billion in total costs. Of those costs, alcohol-involved crashes accounted for \$1 billion in monetary costs and \$2.6 billion in total costs. Costs for traffic crashes in 2004 were more than twice as high as comparable costs for index crimes. Based on dollar losses to the state, the magnitude of the problem of traffic crashes clearly exceeded that of index crimes in 2004.

For comparison of the trends in the costs of index crimes and traffic crashes over time, the overall statewide costs of index crimes and crashes were calculated in 2004 dollars for each year from 1998 through 2004 (see Appendix B). Over these seven-years, there was a decrease in the costs of both index crimes and traffic crashes. However, the costs of index crimes decreased by 12.8%, whereas the costs of traffic crashes decreased by 21.1%. During the same time period, the costs of alcohol crashes decreased by 33.0% and the proportion of crash costs attributable to alcohol-related crashes decreased from 24.4% to 20.7%. For each year from 1998 through 2004, the costs associated with traffic crashes were from 2.4 times to 2.9 times that of the costs of index crimes.

Although the reasons for the decreases in crashes and crash severity, and consequently crash costs cannot be ascertained from examination of crash data, it is reasonable to speculate that concurrent increases in safety-belt use and in the reduction of drinking and driving behavior have played a major role in the decrease of crash costs.

State of Michigan 2004

Index Crime Category	Number of Index Crimes	Index Crime Costs
Larceny	19,048	\$267,454,120
Burglary	6,342	\$214,194,036
Rape	551	\$938,227,472
Assault	31,792	\$419,940,528
Robbery	11,207	\$203,485,499
Motor Vehicle Theft	4,998	\$356,147,768
Murder	638	\$2,655,106,232
Total	353,049	\$5,054,555,655

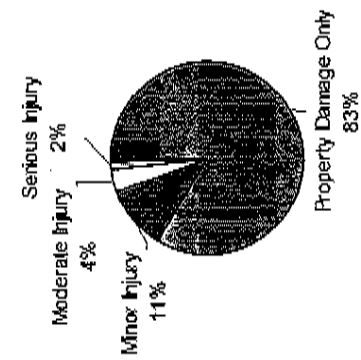
Traffic Crash Casualty Severity	Traffic Crash Casualties*	Traffic Crash Costs
Property Damage Only	499,699	\$1,461,077,262
Minor Injury	6,795	\$2,765,404,914
Moderate Injury	2,245	\$1,346,577,672
Serious Injury	927	\$1,963,871,387
Fatal	115	\$4,840,497,437
Total	600,538	\$12,377,428,673

* The term casualty refers to victims in injury crashes and vehicles in PDO crashes.

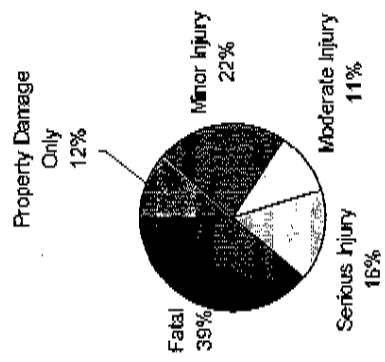
Cost of Traffic Crashes in Michigan (2004 Dollars)						
	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only	Total
Medical Care	\$13,046,537	\$223,469,721	\$14,856,124	\$340,903,855	\$82,106,167	\$846,314,921
Future Earnings (Lost Wages)	\$1,623,006,354	\$385,713,840	\$376,985,110	\$835,714,053	\$274,234,228	\$3,246,631,686
Public Services	\$1,006,838	\$1,781,322	\$2,767,343	\$7,170,960	\$16,267,894	\$29,049,019
Property Damage and Loss	\$12,787,247	\$5,468,602	\$12,444,705	\$302,936,629	\$96,366,900	\$1,269,902,563
Quality of Life	\$1,120,140,191	\$1,094,073,802	\$749,324,454	\$1,269,950,415	\$286,108,280	\$6,485,773,341
Total	\$1,763,560,673	\$1,717,437,265	\$1,253,513,686	\$2,367,775,247	\$1,181,079,461	\$8,383,666,813

Costs of Index Crimes in Michigan (2004 Dollars)								
	Murder	Rape	Assault	Robbery	Larceny	Burglary	Motor Vehicle Theft	Total
Medical Care	\$1,479,681	\$1,794,312	\$10,664,890	\$2,234,648	\$0	\$0	\$0	\$17,173,631
Future Earnings (Lost Wages)	\$948,926,990	\$23,383,650	\$1,106,365	\$27,168,557	\$4,697,055	\$1,973,473	\$4,549,347	\$1,069,048,762
Public Services	\$1,671,176	\$1,683,180	\$2,017,618	\$4,132,115	\$85,663,688	\$21,007,025	\$14,000,000	\$143,270,909
Property Damage and Loss	\$94,181	\$27,108	\$2,190,215	\$12,718,994	\$177,114,417	\$16,612,690	\$19,849,018	\$209,596,534
Quality of Life	\$1,682,942,295	\$89,534,354	\$284,725,129	\$17,000,322	\$0	\$22,598,494	\$14,336,945	\$3,094,485,953
Total	\$3,282,221,273	\$222,343,613	\$1,414,518,837	\$36,154,077	\$182,814,172	\$40,228,216	\$34,186,262	\$6,212,966,430

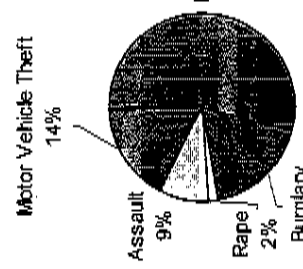
Traffic Crash Casualties



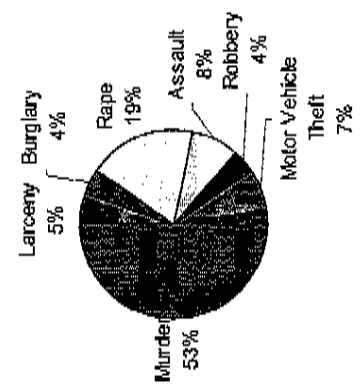
Traffic Crash Costs



Index Crimes



Index Crime Costs

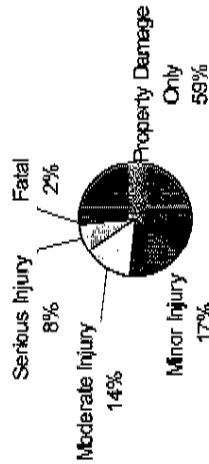


State of Michigan 2004

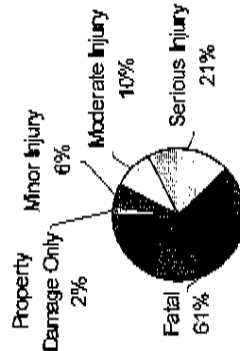
Alcohol-Involved Crashes

Traffic Crash Casualty Severity	Traffic Crash Casualties	Traffic Crash Costs
Property Damage Only	12720	\$48,542,790
Minor Injury	3536	\$143,784,887
Moderate Injury	2897	\$251,503,972
Serious Injury	1663	\$525,592,905
Fatal	364	\$1,593,882,836
Total	21180	\$2,563,307,391

Traffic Crash Casualties



Traffic Crash Costs



Costs of Alcohol-Involved Traffic Crashes in Michigan (2004 Dollars)

	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only	Total
Medical Care	\$10,528,883	\$66,744,418	\$31,764,962	\$20,071,210	\$3,261,031	\$132,370,505
Future Earnings (Lost Wages)	\$550,092,210	\$178,148,020	\$66,703,443	\$40,689,114	\$13,359,945	\$848,992,732
Public Services	\$325,633	\$442,775	\$408,433	\$380,096	\$414,100	\$1,971,037
Property Damage and Loss	\$4,016,012	\$12,473,864	\$13,831,127	\$15,740,238	\$20,272,276	\$66,333,518
Quality of Life	\$1,028,920,122	\$267,783,828	\$138,796,007	\$66,904,229	\$11,235,438	\$1,513,639,624
Total	\$1,925,284,860	\$1,068,648,307	\$521,699,975	\$251,404,787	\$55,543,747	\$4,823,581,676

Allegan County 2004

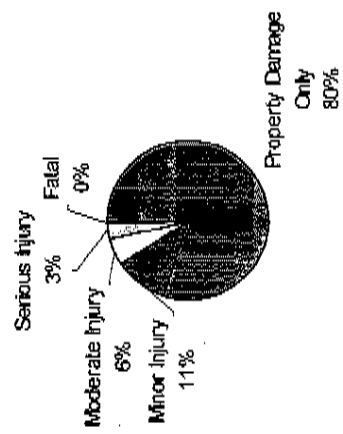
Traffic Crash Casualty Severity	Traffic Crash Casualties	Traffic Crash Costs
Property Damage Only	4248	\$12,420,790
Minor Injury	564	\$22,952,120
Moderate Injury	309	\$17,989,549
Serious Injury	174	\$36,862,311
Fatal	22	\$91,881,746
Total	5308	\$182,106,515

Index Crime Category	Number of Index Crimes	Index Crime Costs
Larceny	1006	\$1,412,464
Burglary	383	\$1,293,438
Rape	47	\$7,994,324
Assault	163	\$2,153,067
Robbery	11	\$199,727
Motor Vehicle Theft	93	\$662,673
Murder	2	\$8,323,217
Total	1705	\$22,038,911

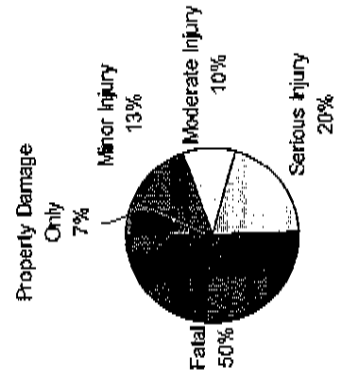
Costs of Traffic Crashes in Allegan County (2004 Dollars)						
	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only	Total
Medical Care	\$636,361	\$4,229,626	\$2,068,794	\$2,904,606	\$697,967	\$10,547,354
Future Earnings (Lost Wages)	\$31,756,807	\$11,912,754	\$5,036,317	\$6,926,203	\$2,331,127	\$57,007,208
Public Services	\$39,681	\$33,060	\$36,971	\$19,537	\$138,294	\$287,523
Property Damage and Loss	\$243,726	\$1,241,334	\$1,369,684	\$2,511,463	\$6,770,175	\$11,934,302
Total	\$39,226,171	\$26,335,357	\$9,478,662	\$10,540,331	\$2,465,247	\$102,263,949

Costs of Index Crimes in Allegan County (2004 Dollars)								
	Murder	Rape	Assault	Robbery	Larceny	Burglary	Motor Vehicle Theft	Total
Medical Care	\$67,334	\$74,469	\$105,850	\$21,824	\$0	\$0	\$0	\$271,517
Future Earnings (Lost Wages)	\$2,974,849	\$291,847	\$273,207	\$26,687	\$24,306	\$11,929	\$8,449	\$3,561,854
Public Services	\$5,082	\$3,922	\$46,234	\$4,272	\$452,291	\$151,008	\$26,051	\$715,840
Property Damage and Loss	\$3,117	\$6,191	\$11,827	\$12,493	\$935,367	\$973,919	\$94,011	\$2,538,236
Total	\$3,072,835	\$7,698,600	\$1,716,918	\$116,476	\$1,944,582	\$1,944,582	\$14,951,967	\$22,038,911

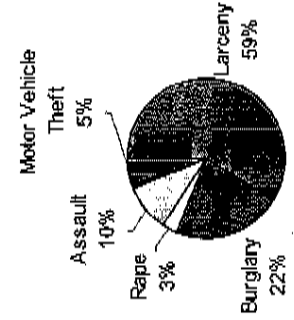
Traffic Crash Casualties



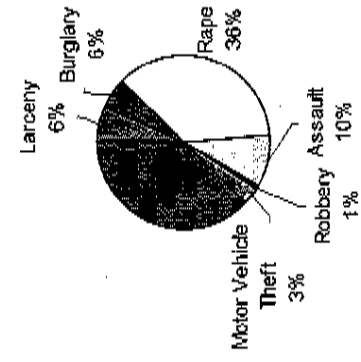
Traffic Crash Costs



Index Crimes



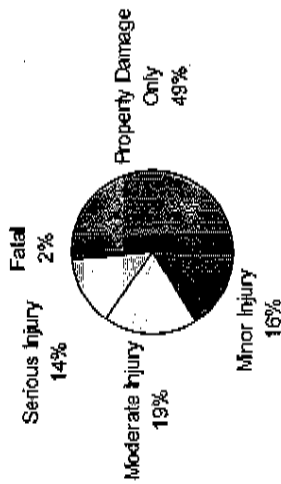
Index Crime Costs



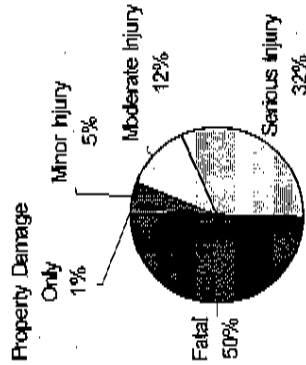
Allegan County 2004 Alcohol-Involved Crashes

Traffic Crash Casualty Severity	Traffic Crash Casualties	Traffic Crash Costs
Property Damage Only	131	\$499,930
Minor Injury	41	\$1,667,189
Moderate Injury	49	\$4,233,951
Serious Injury	36	\$11,377,838
Fatal	4	\$17,515,196
Total	261	\$35,314,103

Traffic Crash Casualties



Traffic Crash Costs



Costs of Alcohol-Involved Traffic Crashes in Allegan County (2004 Dollars)

	Fatal	Serious Injury	Moderate Injury	Minor Injury	Property Damage Only	Total
Medical Care	\$115,702	\$1,444,858	\$537,274	\$232,726	\$33,585	\$2,364,145
Future Earnings (Lost Wages)	\$6,044,969	\$3,856,481	\$1,128,225	\$471,791	\$137,591	\$11,639,058
Public Services	\$3,578	\$9,585	\$6,908	\$4,407	\$4,265	\$28,744
Property Damage and Loss	\$44,132	\$270,030	\$233,940	\$182,508	\$208,779	\$939,389
Total	\$11,306,815	\$5,796,884	\$2,347,602	\$775,756	\$115,711	\$20,342,768