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FINANCIAL CONSEQUENCES OF
SERIOUS INJURY

FINAL REPORT

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16. Abstract <p>A pilot study was conducted to collect data on the financial consequences of serious and worse traffic injuries through the use of personal interviews. Study objectives included the development of feasible methodology and the collection of illustrative costs. A sample of 120 case vehicle occupants was randomly drawn from a population of 241 Washtenaw County case vehicle occupants who had sustained serious (OAIS-4), critical (OAIS-5), or fatal (OAIS 6-10) injuries during the period of December, 1967, through December, 1974.</p> <p>The results indicate that a personal interview is a reliable method for collecting consequences of OAIS-4 and OAIS-5 injuries but that locating accident victims can be difficult. Due to consistent negative reactions, interviews were not conducted for fatal cases. Data on lost wages, medical costs, impairment, property damage, legal costs, activity restrictions, and loss recovery were collected. Results of this and a previous study of OAIS-1 to -3 costs are summarized. While the results are not definitive, some insight into the increase in costs at higher levels of injury severity can be gained.</p>					
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SUMMARY

This report describes a study of the methodology of investigating the consequences, financial and functional, of serious (OAIS-4 or greater) injuries resulting from automobile accidents. The present project is an extension of HSRI's previous work in identifying the costs of injuries at the OAIS-1, -2, and -3 level (Flora, Appendix A).

A random sample of twenty cases in each of the three severity classes under consideration (OAIS-4 = serious, OAIS-5 = critical, and OAIS-6 through OAIS-10 = fatal) was drawn from a list of such accidents investigated in Washtenaw County, Michigan, over the period 1967-1974. The accident victims or close relatives were contacted in an attempt to interview them according to a special protocol developed for this study.* The major methodological issue was whether retrospective investigations of this type are adequate to establish the costs of serious injury. At the same time an evaluation was made of the time and difficulty of obtaining the required information.

Methodology

Cases involving fatalities exhibited two major problems: the interview protocol developed for serious injuries (even when modified) did not really address the necessary topics, and there was a consistently high refusal (by relatives) to reopen discussion about a case because of bad memories. As a result we did not pursue these interviews, but did compute several statistics from available case data. For this set of accidents the fatal victims were relatively young (average age = 31), and the computed expected number of years of life lost (from actuarial tables) averaged 42.

By contrast with the cases involving fatalities, cases involving injuries at the "4" and "5" level were relatively successful. The success in locating people was not as good as obtaining interviews; 27 of 39 persons were located, while 24 of 27 people contacted agreed to inter-

* Every effort has been made to preserve the confidentiality of the information acquired.

views. The principal difficulty in locating persons was the mobility of college age individuals. Only 7 of 14 persons in the 18-21 age group could be located.

Results

Recognizing the limitations of the sample size and provinciality of the data, the total of lost wages, medical costs, vehicle damage, and legal costs is shown in the table below. The values for OASIS-1 through -3 are taken from Flora's earlier study (Appendix A), and all costs have been updated to 1975 dollars.

Injury Level (OASIS)	Total Costs (medical+wages+damage+legal)*		
	Mean	Median	Range
1	\$ 983	\$ 68	\$0 - \$4,327
2	2,497	2,443	1,775-3,382
3	7,568	5,972	2,569-16,313
4	46,924	18,121	4,457-217,979
5	68,134	19,110	\$4,730-364,693

The consequences of AIS-4 and -5 injuries, which are the subject of this study, are distinctly different from the lower-level injuries. Twenty-one of the persons interviewed had sustained severe closed-head injuries resulting in loss of consciousness, coma, or a high degree of disorientation. In more than half of these cases the persons still (3 to 9 years later) report occasional episodes of dizziness, poor coordination, loss of fine motor control, or speech slur. In addition, more than half of these persons have some continuing physical impairment--the least of which is intermittent pain or soreness of a joint, and the most severe being a quadraplegic.

The in-depth discussions in the interviews brought out a number of non-quantifiable effects of the injuries--both to the patients and to their families. These were pronounced secondary effects on physical and

* Since certain costs such as (1) insurance administration, (2) traffic delay, (3) community services, and (4) losses to others were not collected, these costs are different from the total 1975 Societal Costs published by DOT (Appendix B).

mental health. In one case the patient's poor balance ultimately led to her falling and breaking a hip. In another case the wife of a patient was treated with tranquilizers that reportedly caused birth defects in her child, who died shortly afterwards.

Without exception, patients at the OAIIS-4 and -5 level needed family assistance during their recovery. While there was no monetary expenditure for such services as feeding, driving, housekeeping, etc., many relatives spent weeks, months, or years in these duties as a direct consequence of the injuries--occasionally with the loss of their own wages.

Conclusion

The in-depth interview method provided some capability for checking consistency of responses, and in a few cases outside information was available to confirm the validity of the patients' responses. The interview responses are judged to be valid, and thus this method is suggested for use in a less provincial sample frame, such as the National Accident Sampling System of the NHTSA. Missing cases might be minimized by maintaining some occasional contact with the accident-involved persons for several years after the accident. Up to three or four years for follow-up will be required in some cases before medical and legal expenses are entirely settled.

1.0 INTRODUCTION

This is the final report on a study of the financial consequences of serious injury. The study had two objectives: (a) to develop a feasible methodology, and (b) to collect illustrative costs for serious or worse injuries incurred by vehicle occupants in traffic crashes. This report describes the data collection design and experience, including definition of the sample, experience in locating the sample cases, procedures for collecting the financial consequences data, and interpretation of the results.

1.1 Background

There has been and will continue to be a growing interest in the ability of decision-makers to determine (and/or predict) the "societal consequences" of highway accidents. Typically societal consequences have been scaled in terms of "societal cost" to permit a cost-benefit analysis of decision alternatives. The extensive literature on the consequences of traffic crashes and cost-benefit analysis testifies to the growing concern with these issues.

Societal costs of traffic accidents have frequently been determined in terms of broad loss categories (e.g., total disability) or broad injury categories (e.g., fatal, injury, property damage). In reality, specific countermeasures may not prevent an "injury" but may change the relative distribution of injury severities (e.g., prevent serious injury while causing minor injuries). Consequently the current interest is in measuring societal consequences (e.g., cost) in terms of injury severity, specifically the Abbreviated Injury Scale (AIS).^{*}

^{*}(a) Faigin, "Societal Costs of Motor Vehicle Accidents, 1975," NHTSA. December, 1976, 38 p. DOT-HS-802-119 (See Appendix B).

(b) "Injury Scaling Research," University of North Carolina, Contract DOT-HS-7-01539 now in progress.

There are effectively two ways one can develop societal costs as a function of injury severity: (a) indirect composition and (b) direct clinical observation. The analyst uses "indirect composition" when he uses diverse data resources to develop a composite cost that covers the desired cost components (e.g., medical, legal) for each level of injury severity. This approach is effectively the current state-of-the-art because of the lack of more direct data resources. It is the approach used by Faigin in developing the 1975 costs.

The other approach is to perform "direct clinical observations" of the ultimate consequences (e.g., expenses, death, disabilities) of individual crash victims in order to determine societal consequences in terms of injury severity. This was the approach taken by Flora in 1974 (Appendix B) and critiqued by Faigin: "The study sample was very small but the study does point the way to an expanded data collection effort on the entire range of AIS."^{*}

The 1974 Flora study, performed under MVMA sponsorship, considered Overall AIS (O AIS) levels 1, 2, and 3. This study expands the range of O AIS considered to level 4 (serious), 5 (critical), and 6-10 (fatal within 24 hours). Cost data on fatal cases were not collected due to the strong negative reaction of the interviewees and the difficulty of interpreting the results (See Section 3.3).

1.2 Objectives

A primary objective of this study was to develop a feasible methodology for collecting cost data by means of direct interviews with accident victims. The experience gained in the development of survey instruments and interview techniques will be valuable to any subsequent study in this area. Field experience is lacking in terms of (a) what data elements are practical for field collection, and (b) what data collection techniques have the greatest payoff (e.g., response rate vs. investigative expenses).

^{*}"Societal Costs of Motor Vehicle Accidents for Benefit-Cost Analysis: A Perspective of the Major Issues and Some Recent Findings." B.M. Faigin, Office of Program Planning, NHTSA, In Proceedings of the International Congress on Automotive Safety. July, 1975.

Some data elements essential for a particular analytical technique or model may not be collectible in the field. Generally indirect costs (e.g., insurance administration) cannot be determined by direct observation or interview. Other related injury consequences, such as percent impairment or percent of work efficiency lost, might be obtainable by direct observation (e.g., clinical measurement) but probably not through the use of a personal interview. Even such objective data as dollar amounts can be difficult to obtain if the interviewee is uncooperative, has lost his bills, or exaggerates his expenses.

Several different techniques have been employed in past research concerned with identifying and locating occupants, soliciting their cooperation, and interviewing them. This study used personal interviews, with phone interviews conducted only if circumstances prohibited a personal interview. The time expended and response rates are documented in terms of the age of the case (time from crash to interview), age and sex of subject, and severity of injuries.

The second objective of the study was to illustrate the costs related to serious or worse injuries. Because the sample of cases was limited in size and geographical distribution, the analysis did not produce a nationally representative cost distribution. The analytic product is illustrative of the results one might expect in a more extensive direct investigation of costs, particularly in terms of ranges, magnitudes, and types of cost components reported.

All cost figures are updated to a common 1975 basis, including the results of the earlier cost figures for OAIS 1, 2, and 3 collected by Flora. These illustrative cost figures are then compared with the 1975 Faigin cost figures on a cost component basis for each OAIS level. Since no fatality cost figures were collected in this pilot study, the results are not reinterpreted in the context of the new AIS/76.*

* The Abbreviated Injury Scale, 1976 Revision. American Association for Automotive Medicine, Morton Grove, Ill. 1976.

2.0 SAMPLE SELECTION

A stratified random sample of 120 cases was selected for this study from 241 local traffic accidents investigated by University of Michigan teams. Twenty cases were randomly selected for each of three OAIS levels: 4, 5, and 6-10. Twenty replacement cases were also randomly selected for each of these three OAIS levels. Thus the 40 cases for each of the three levels (20 initial and 20 replacement) make up the total of 120. The selected Washtenaw County cases that required no more than approximately an hour's drive to conduct a personal interview were identified and investigated (See Section 3).

The accident cases studied in this pilot survey were randomly selected from Institute computer files of in-depth investigations of accidents that occurred in Washtenaw County, Michigan. These cases were originally investigated by Dr. Donald F. Huelke, professor of anatomy at The University of Michigan (UM team), between December, 1967, and December, 1974, or by Peter Cooley, research scientist at the Highway Safety Research Institute (AA team), between July, 1971 and April, 1973 (Table 1).^{*} This broad time period permitted observation of the trade-off between sufficient time for costs to have been settled vs. losing the ability to locate the occupant and collect the data (e.g., old medical bills misplaced or discarded).

Table 1
OAIS 4-10 Cases by Team and Year of Collision

Team	67	68	69	70	71	72	73	74	Total
AA	0	0	0	0	24	25	2	0	51
HS*	0	0	0	0	0	0	0	4	4
UM	<u>4</u>	<u>30</u>	<u>38</u>	<u>29</u>	<u>29</u>	<u>15</u>	<u>29</u>	<u>12</u>	<u>186</u>
Total	4	30	38	29	29	15	29	16	241

^{*} Four additional Washtenaw County cases of OAIS 4-10 were found in the 18 months (3/74 - 8/75) of Restraint System Evaluation Study cases (HS team).

The cases originally selected for inclusion in the in-depth investigation file were restricted to recent-model vehicles (less than three years old). Of the 241 cases with an OASIS of 4-10, 61 percent were fatalities, including 16 fatalities in the OASIS-4 and OASIS-5 cases (Table 2).

Table 2
OASIS 4-10 Fatalities

OASIS	Candidate Occupants		
	Non-Fatal	Fatal	Total
4	60	8	68
5	32	8	40
6	0	76	76
7	0	16	16
8	0	24	24
9	0	7	7
10	0	10	10
Total	92	148	241

A random number generator was used to select a random sample of 20 persons who have sustained an OASIS of 4. Independent samples of 20 persons were also drawn for persons with an OASIS of 5 and for persons with an OASIS of 6 through 10. A random set of replacement cases was also drawn at the same time. While the replacement cases were randomly drawn, the order in which they were drawn was preserved. Subsequently, the first randomly selected replacement case was substituted for the first case in the primary sample for which a respondent could not be located. Twenty replacement cases were drawn for OASIS levels 4, 5, and 6-10. Thus a total of 120 study and replacement cases were drawn.

After the cases were selected, they were given a preliminary screening to determine whether they were within the scope of the project. Cases were "in scope" if (1) the accident was investigated by a University of Michigan field team, (2) the accident occurred in Washtenaw County, Michigan, (3) the case vehicle occupant has an original police-reported address within approximately one-hour's drive of Ann Arbor (a pragmatic consideration), and (4) the occupant sustained an OASIS-4, -5 or 6-10 as sampled.

Of the 120 sample cases, only 81 percent (97/120) actually occurred in Washtenaw County. The remainder occurred in other Michigan counties (e.g., Wayne, Oakland, Livingston, Genesee). A review of the original police-reported addresses indicated that 86 percent (83/97) were within one hour from Ann Arbor. Of these beyond one hour, eight were Michigan addresses, five were from other states, and one was a foreign address (London, England). Of the remaining cases 7 percent (6/83) had incorrect OAIS codes: two cases coded OAIS-4 were actually an OAIS-2 or -3 (unconscious for unknown time period), another OAIS-4 was an OAIS-6 (fatal within 24 hours), and three OAIS-6 victims were OAIS-5's (died 5 to 21 days later). Unreadable police reports accounted for the loss of two more cases. Through the combined case elimination for all four screening factors, 38 percent, or 45 out of the 120 sample cases were dropped, leaving 75 as interview candidates (Table 3).

Table 3
Selection of Final Sample

	<u>Sample Cases</u> <u>Number</u>	<u>Cases Remaining</u> <u>Percent</u>	<u>Individual</u> <u>Factors</u> <u>Percent Lost</u>
Original Sample	120	100	
Not Washtenaw County	- <u>23</u>	- <u>19</u>	19% (23/120)
	97	81	
Not Local Reported Address	- <u>14</u>	- <u>12</u>	14% (14/97)
	83	69	
Invalid OAIS	- <u>6</u>	- <u>5</u>	7% (6/83)
	77	64	
Unusable Police Report	- <u>2</u>	- <u>2</u>	3% (2/78)
Final Sample	75	62	38% (45/120)

A better case selection method would have been to screen the entire population of 241 for "in scope" cases before drawing the random sample of 120 cases. This alternative approach would have fixed the stratum sample sizes and produced a known sampling factor. On the other hand, initial screening would have taken more effort and might not be practical in a larger-scale study. Each case has the same probability of being selected in either approach.

3.0 DATA COLLECTION PROTOCOL

The data collection procedures and instrument used for the available 39 non-fatal OASIS-4 and -5 cases are described in this and the next section. The data collection procedures were not executed for the 36 sampled fatalities because of the bad memories evoked and the uncertain applicability of the data collection instrument (see Section 3.3). Section 3.4 discusses the methodology for converting the financial data to a common base of 1975 dollars.

3.1 Data Collection Procedures

There were three distinct phases to the data collection process--identification, contacting, interviewing. Identification involved obtaining a current telephone number or address for each subject. Contacting involved reaching each subject and arranging an interview date. Interviewing involved conducting a structured conversation and recording the pertinent data items. The overall response rates were summarized in Table 4 for the 39 non-fatal cases. The final status of all the cases is tabulated in Section 3.3.

Table 4

Data Collection Response Rates for 39 Non-Fatal Cases

<u>Cases</u>	<u>OASIS-4</u> <u>% (n/N)</u>	<u>OASIS-5</u> <u>% (n/N)</u>	<u>Total</u> <u>% (n/N)</u>
Identified and Contacted/Total	74 (14/18)	62 (13/21)	69 (27/39)
Interviewed/Contacted	79 (11/14)	100 (13/13)	89 (24/27)
Interviewed/Total	61 (11/18)	62 (13/21)	62 (24/39)

3.1.1 Identifying Subjects. Identifying the sample respondents in this pilot study was a challenge because of the age and severity of the cases. Two-thirds of the cases were over five years old. The most recent case sampled was from September, 1974; the oldest occurred in January, 1968. Because no confidential information (e.g., telephone number) was retained by any of the Institute field teams, the subjects were identified from the original police report.

Several techniques were used to identify the sample subjects, including those used by Institute field accident investigation teams. The original police reports contained the subjects' name, reported address, and, occasionally phone numbers. The police reports also contained the names of other occupants (who might have more information).

Using the telephone directories to identify subjects who have remained in the local area and have a listed telephone number was relatively straightforward. Subjects with unlisted telephone numbers, no telephone (e.g., fatals), or telephone numbers listed under another name (e.g., children living at home) were less easy to identify. For children and married women, who may not have phones listed in their own name, only last names were used. Addresses were used to locate telephone numbers (and vice versa) in Bresser's Cross Index Directory.^{*}

Other occupants were also contacted to find current phone numbers and/or addresses of subject. If the subject had moved, new occupants in the residence were contacted for a forwarding address. Unfortunately, the U.S. Post Office does not search out or retain addresses over 1 or 1½ years old. The use of obituaries and newspaper articles was time-consuming and relatively unproductive. Not all death notices and news articles gave names of other family members.

^{*}Bresser's Cross Index Directory. Walter Bresser & Sons, Detroit, Michigan 48202. 1976.

A letter inviting the subject's participation (Appendix C) was mailed to the last known address when no phone number or recent address could be determined. The letter briefly explained the study and its importance, and invited the subject to return a stamped self-addressed postcard with a present address and phone number, so that a more complete explanation of the project could be provided.

Of the 12 letters mailed, 3 addressees reported favorably and one was returned by the Post Office as "addressee moved, no forwarding address." Of the 8 follow-up letters mailed, 3 more addressees reported favorably and one was a refusal. Of the 4 outstanding letters, one subject had an unlisted phone, and is believed to be living at that address but is choosing not to respond. The status of the other 3 outstanding subjects that have been mailed letters is unknown. An additional 8 non-fatal cases had invalid or missing police-reported addresses.

Thus the overall success rate in locating OAIS-4 and -5 subjects was 69 percent (27/39) for case vehicles not involving fatalities. By injury severity, the success was 78% (14/18) for OAIS-4 and 62% (13/21) for OAIS-5.

The most difficult cases to locate were fatalities, women, and college-age people. Fatalities are rarely still listed in the phone book, unless a wife chooses to keep the listing under her husbands' name. While men and women were located with equal success, in a larger study, women may be more difficult to find when they marry and change their surnames. College-age people are highly transient. They may have finished school and left the area to find jobs, marry, etc., having lived in six places during the interim. Only half (7/14) of the 18 to 21 age group were located.

The easiest case to locate involved a fellow HSRI staff member in a neighboring office. The age of a case did not consistently affect the ability to locate a subject to the same degree as did the subject's life situation. (Table 5).

Table 5
Case Age by Percent Located

Case Age (Years)	Percentage Located	
	%	(n/N)
3	50	(1/2)
4	40	(2/5)
5	100	(4/4)
6	78	(7/9)
7	100	(7/7)
8	60	(3/5)
9	43	(3/7)
Overall	68	(27/39)

3.1.2 Contacting Subjects. Contacting potential respondents involved acting on information collected during the identification phase. Subjects were contacted by telephone in order to explain the project (informed consent) and to set up an appointment date for an in-person interview. "Wrong numbers" placed the case back into the identification phase. If contacts were made with persons unable to provide the needed information, they were asked for guidance on who might provide it. Because of the severity of the OASIS-4 and -5 cases (e.g., coma), typically another family member handled the financial matters and retained the medical records. When the appropriate person was contacted, the project was explained according to the interview guideline included in Appendix C. The subject was informed about (a) the nature of the study, (b) the procedures to be followed (i.e., personal interview), (3) the confidentiality of the information (not disclosed except by court order), and (d) the voluntary nature of their participation.

People were usually cooperative when told their experiences might help future accident victims. There were only 3 refusals out of 27 contacts, for a response rate of 89% (24/27). One refusee returned the mailed post-card marked "did not wish to participate," one repeatedly cancelled the interview, and one declined because of bad memories (whole family injured).

A few people offered initial resistance because of disappointment from participation in other interviews (e.g., copy of results not supplied as promised).^{*} An effort should be made to leave interviewees with a positive attitude (e.g., follow through on promises). This can only enhance the goodwill of the interviewing organization and may help smooth the path for subsequent interviewers.

Several alternative procedures for contacting subjects also evolved. These included mailing an initial contact letter as described in the previous section. These were followed up by telephone with the complete project description and interview appointment, as in a normal case. Two other letters were also used (Appendix C). One provided a written project description, if requested by the subjects, for their consideration and/or personal files. An outline of the desired data was also supplied to some subjects to aid in their preparation for the interview. Although not attempted in this study, personal visits as the initial contact may be made if the subject has a local address and no telephone is available, but this is potentially more intimidating and expensive. On the other hand, it may provide good location leads if the subject has moved, or may lead directly to an interview.

3.1.3 Interviewing Subjects. The primary mode of interviewing was in person. In five cases where an in-person interview was impractical, a telephone interview was conducted. Since the questionnaire is not self-explanatory, it was not mailed to subjects for their independent completion. When requested, an outline of the types of desired data was mailed to aid the interviewee's preparation.

Each case was reviewed in preparation for an interview, particularly in terms of the overall accident situation and the subject's injuries. The first two pages of the questionnaire (Appendix D) were tentatively filled in before each interview. In that way the accident and injury questions could be covered by way of confirmation during the interview. This approach also helped demonstrate to the subject that the interviewer

^{*} Requested copies of this report are being supplied to 17 subjects.

had done her "homework." Interviewees were also recontacted to confirm the interview date if it had been set more than a week beforehand.

Occasionally several family members received the same severity injury (OAI 4 or 5) in one accident. When this occurred in the Flora study, data were obtained separately on all persons injured in the accident and living at the address where the interview was conducted. This additional data, obtained with negligible additional effort, provided data on slightly more individuals, and tended to improve the quality of the data overall, since it avoided possible confusion about which member of the family sustained which costs, and also elicited better cooperation from the subjects. One additional OAI-4 subject was added to this study through this procedure--resulting in a total of 25 interviews.

The interview questionnaire follows a structured format in order to lead the subject through each topic. Since it does not contain well-defined objective questions, the form was not provided to subjects for their personal completion. Rather, the interviewer used the questionnaire as a detailed queue card and note-taking form.

Although there was usually some initial hesitancy, all of the subjects interviewed were ultimately quite willing to talk about their accidents. Most of the subjects had not handled their own finances. There was a high incidence in (19) of unconsciousness, coma, and retrograde amnesia, due to severe closed head injuries. Many were disoriented after regaining consciousness. Consequently the best cost data were available from parents, spouses, or whomever took care of the financial details. Some people maintained detailed records in notebooks, while others kept no records and could only estimate their expenses. The age of the case did not seem to affect the availability of records; subjects either kept them or did not keep them.

The interviews were generally permitted to follow a natural flow of conversation. Roughly half of the time was spent discussing aspects of the accident not directly related to the questionnaire, and usually the topics of interest were not discussed in the exact sequence of the questionnaire. Consequently, each questionnaire was reworked and filled in with more detail immediately following each interview. A thank you note was also sent to each subject following his or her interview.

In cases where records had not been kept the respondents were confident that their cost estimates were accurate within several hundred dollars. They were also willing to sign temporary release forms for access to insurance and/or hospital records. Unfortunately, both of the primary local hospitals purge their files after one year if the bills have been paid. Fortunately, we were able to obtain sufficient data from the personal interviews to avoid having to contact insurance companies.

The time required for personal interviewing (including preparation, travel, interviewing, and follow-up) averaged approximately 4 hours per case with a minimum of one hour and a maximum of 9 hours (including several visits and extensive follow-up). No interviews were conducted outside of a one-hour driving time radius, although one subject drove five hours round trip for an interview in Ann Arbor.

3.2 Data Collection Instrument

The data collection instrument was designed as a questionnaire for conducting a structured in-person interview. The contents are based upon the items used in the OAIS 1-3 study, augmented by a review of the questionnaire used in the Massachusetts No-Fault Study.* The questionnaire (Appendix D) and interviewer guide for informed consent (Appendix C) were approved by The University of Michigan Medical School Human Subjects Committee (Appendix E).

As in the Flora study (Appendix A) data collection was restricted to data items obtainable from personal interviews. Consequently this pilot study was not able to collect data on certain costs, such as (1) insurance administration, (2) accident investigation costs, (3) traffic disruption, (4) home, family and community services and (5) losses to others, that were compiled in the DOT "1975 Societal Costs" (Appendix B).

The costs of insurance overhead cannot be determined from individual case studies. While police services and traffic disruption are specific to individual cases, their costs cannot be derived from the interviews with the crash victims.

* Alan I Widiss, "Accident Victims Under No-Fault Automobile Insurance: a Massachusetts Survey." In Iowa Law Review, Volume 61, Number 1, October, 1975. pp. 1-72.

The loss of services to home, family, and community might be quantified in terms of specific duties or tasks over time periods of inactivity for individual cases, but the method for imputting cost figures for services lost is uncertain. The losses to others include the services performed by family, relatives, neighbors, and friends. Although these services were significant for OAIIS-4 and -5 cases, their pricing is also uncertain.

The questionnaire covers several different accident loss and cost components. Section I (Questions 1-8) of the questionnaire verifies certain critical accident factors and helps establish rapport between the interviewer and respondent. Section II (Questions 9-13) reviews the specific injuries and resultant impairments and/or disfigurements on a body-region-by-body-region basis. This review provides a framework for the subsequent discussions of treatment, activity restriction, and losses. These two sections were partially prefilled beforehand and verified during the interview.

Outline of Questionnaire

I. Accident Description

When, Vehicles, Collision Type
Vehicle towed, Any occupants transported to hospital

II. Injuries/Consequences

Injury - Impairment - Disfigurement
Head, Face, Chest, Abdomen, Pelvis, Back, Extremities

III. Treatment

Medical treatment - by facility, Ambulance
Medical expenses - hospital, drugs, physician, appliances
Funeral expenses

IV. Activity Restrictions

Work days lost, Wages lost
Restriction by type - bed, crutches, cast
Help by others - hired, not hired
Claim settlement days, Convalescence days
Work efficiency, job changes, income changes

V. Loss/Recovery/Damages

Medical costs paid by -
Wage loss paid by -
Damage to vehicle, clothing, cargo, property; Paid by -
Legal action, settlement, fees, costs, time
Open comments from respondent

Section III (Questions 14-18) covers medical treatment with separate coverage for each medical cost component, e.g., hospitalization, drugs, physician. In the future funeral expenses should not be included on a revised OAS-4 and -5 form. A separate form for fatalities is needed so that only the appropriate questions are available by case severity. The questions on therapy and rehabilitation should be expanded to detail isolated visits (e.g., 1 per week) and cases of in-patient rehabilitation.

The last two sections of the questionnaire include activity restrictions and loss recovery. Activity restrictions (Section IV, Questions 19-31) by work days lost, type of activity restrictions (e.g., crutches), outside help, claims settlement, and work performance are considered. Loss recovery (Section V) includes the nature and extent of medical cost and wage loss recovery, as well as incidental damage costs and their recovery. Questions related to time expended in claims settlement and vehicle repair were difficult to answer, although the calendar time period involved was frequently known. It was also more natural to discuss medical cost recovery along with medical costs (Section III). Likewise for wage loss/recovery and vehicle loss/recovery. Consequently the loss recovery components of Section V would be more appropriately grouped with the loss questions.

3.3 Fatal Cases Dropped

Fatal cases were dropped from this pilot study for two reasons: (1) contacting the subject's family evoked bad memories, and (2) the applicability of the data collection instrument is uncertain. Each issue is discussed here in turn.

Contacting interviewees in fatality cases triggers and rekindles strong feelings of bereavement, grief, and bitterness--even six to nine years after the accident. This includes both the relatives of 30 fatal subjects (OAIS-4 to -10) and 6 non-fatal subjects (OAIS-4 and -5) that lost relatives in the same case vehicle. The non-fatal subjects sometimes have the added burden of guilt feelings.

Contacts with five interviewees in cases involving fatalities consistently evoked bad memories. Four contacts were refusals (some emotional) and a fifth resulted in a somewhat strained interview. Because no further efforts were made to contact or interview other fatal cases, these four contacts and one interview are not included in the response rates (Section 3.1) or results (Section 4). The final status of all the original 120 sample cases is tabulated in Table 6.

Applicability of questionnaire data elements is also uncertain. Many of the data elements do not apply to fatalities, e.g., impairment, disfigurement, medical treatment (with some minor exceptions), and activity restrictions. Most of the remaining elements are relatively minor or unimportant, e.g., vehicle damage, towing expense, ambulance expense, and even funeral expenses. These could be fairly easily estimated without personal contact with the subject's family.

Table 6
Final Status of 120 Sample Cases

	<u>OAIS 4</u>	<u>OAIS 5</u>	<u>OAIS 6+</u>	<u>Total</u>
<u>Non-Criteria Cases (2.0*)</u>				
Not Washtenaw Accident	7	10	6	23
Not Local Reported Address	5	3	6	14
Unreadable Police Report	0	0	2	2
Misclassified OAIS	3	0	3	6
	<u>15</u>	<u>13</u>	<u>17</u>	<u>45</u>
<u>Fatality Cases (3.3*)</u>				
OAIS 6+	0	0	23	23
Fatal OAIS 4	3	0	0	3
Fatal OAIS 5	0	4	0	4
Related Fatality	4	2	0	6
	<u>7</u>	<u>6</u>	<u>23</u>	<u>36</u>
<u>Data Collection Cases (3.1*)</u>				
Interviewed	11 **	13	0	24 **
Refused	3	0	0	3
No Response to Letter	2	3	0	5
Not Identified	2	5	0	8
	<u>18</u>	<u>21</u>	<u>0</u>	<u>39</u>
Total	40	40	40	120

* Refer to Section number for explanation.

** An additional OAIS-4 subject was interviewed in the home of a sample case. (See Section 3.1.2) for a total of 12 OAIS-4 interviews and a grand total of 25 interviews.

Income (and its recovery) is the primary cost component for fatalities. But what income figure should be used for the unemployed (e.g., female high school senior?). Is foregone earned income (or production loss) a meaningful technique for assigning a value to life? If not income, why not use life insurance policy principals, court awards, or even increased longevity^{*}?

Clearly the inclusion of fatalities in this pilot study opened the whole Pandora's box of how best to place a value on human life. It was unclear how best to use personal interviews in a clinical study of traffic fatality costs.

^{*} Schwing, R.C. Risks in Perspective Longevity as an Alternative to "Lives Saved", General Motors Corporation, GMR-2133, 17 p. Feb. 26, 1976.

3.4 Conversion to 1975 Dollars

All the cost figures in Section 4, Results, are reported in constant 1975 dollars - the same base year used in the DOT 1975 Societal Costs. The raw interview data were reported in current dollars, i.e., dollars in the year the loss was incurred. Since the losses reported for individual cases ranged over several years and the dates of the accidents ranged over seven years, it was necessary to convert the dollars to a base year. The losses reported in the Flora study of OAI-1 to -3 subjects were also updated from 1972 to the base year of 1975.

The conversion factors to constant 1975 dollars are displayed in Table 7 for current 1968 through 1976 dollars. For example a wage loss, of \$10,000 current 1972 dollars is equivalent to \$12,030 (10,000 x 1.203) in constant 1975 dollars. The wage loss conversion factors are based upon weekly earnings. The cost conversion factors in the other four columns are based upon the Consumer Price Index (CPI).

Table 7
Conversion Factors from Current to Base 1975 Dollars

	<u>Wage</u> ¹	<u>Medical</u> ²	<u>Vehicle</u> ²	<u>Legal</u> ²	<u>Others</u> ²
1968	1.530	1.589	1.459	1.409	1.547
1969	1.430	1.486	1.404	1.351	1.468
1970	1.371	1.398	1.336	1.270	1.386
1971	1.287	1.313	1.269	1.219	1.328
1972	1.203	1.272	1.256	1.174	1.286
1973	1.126	1.224	1.216	1.142	1.211
1974	1.061	1.120	1.093	1.074	1.091
1975	1.000	1.000	1.000	1.000	1.000
1976	-----	0.913	0.909	0.962	0.945

¹Based on gross average earnings

²Based on Consumer Price Index

Wage losses from the time of the accident through 1975 were converted to the base year of 1975 according to the factors in the first column of Table 7. These factors were derived from the gross average of weekly earnings of private non-agricultural workers as tabulated on per-annum basis by the Bureau of Labor Statistics.* Since the earnings used were expressed in current dollars for the year earned, the conversion factors provide an estimate of 1975 earnings. Note that this approach does not account for changes in the purchasing power of the dollars, but is intended to estimate actual 1975 gross wages.

Current dollars for medical; property damage; legal and court; and other costs were converted to constant 1975 dollars according to factor in the remaining columns of Table 7. These factors were derived from the Consumer Price Index (CPI) as prepared by the Bureau of Labor Statistics.** The "medical" CPI was used for medical costs. The "transportation" CPI was used for property damage because the major cost component was vehicle replacement. The "other goods and service" CPI was used for legal and court costs and the "overall" CPI was used for the other costs. These conversions are intended to estimate the actual cost of these components in 1975. Compensation for wages were adjusted by the "wage" factors and all other compensation (insurance and legal settlements) were adjusted by the overall CPI ("Other") in Table 7.

* World Almanac and Book of Facts 1977. Newspaper Enterprise Association, Inc., N.Y., pp89-1977.

** The Handbook of Basic Economic Statistics. Economic Statistics Bureau, Washington, D.C. Vol. XXXI, No. 4, pp102, April 1977.

4.0 RESULTS

The results of the 25 interviews with OAI5-4 and OAI5-5 subjects are discussed in terms of their financial and functional losses (Section 4.1). Years of life lost for OAI5-6 to -10 subjects are displayed (Section 4.2) then the results of this survey and the 1974 Flora survey are summarized (Section 4.3). As in the DOT 1975 Societal Costs (Appendix A), the dollar figures throughout this section have been adjusted to a base year of 1975 (see Section 3.4).

4.1 OAI5-4 and -5

This section discusses each cost component in turn, while comparing OAI5-4 and -5 results where they differ. The results are tabulated on a case-by-case basis because of their individual clinical interest. Due to the small sample size the results are only exemplary of inferences that might be drawn from a larger study.

The OAI5-4 and -5 cases are a unique subset of accident victims--different from both the less seriously injured and the fatal cases. Many individuals have a sense of having lived through a miracle, and some have taken on a different perspective of life. While the wage and medical losses were the major cost components, the non-quantifiable losses also played a significant role.

The mean total costs to the individuals were \$46,924.00 and \$68,134 respectively for the OAI5-4 and -5 groups. The mean length of activity restriction was 30 months and 63 months*, respectively, while the number of hospital days averaged 52 days and 66 days for the OAI5-4 and -5 groups. Two-thirds (17/25) of the cases were left with some degree of permanent physical impairment. Both the subjects and their families experienced significant changes of life style and health (physical and mental) that could not be quantified in dollars or time.

*Includes three cases of significant permanent physical impairment.

4.1.1 Financial Consequences. Financial consequences for the individual cases are displayed in Table 8 in terms of 1975 dollars. The financial losses have been aggregated into five categories: wage loss, medical costs, vehicle losses, legal/court costs, and others, including family help. Wage loss and medical costs were the major components, while vehicle, legal/court, and other costs accounted for only ten percent of the total average cost of \$57,953.00 per individual (OAI5-4 and -5). The average loss recovery was \$24,915 and \$56,896 for OAI5-4 and -5 respectively and \$41,545 overall (OAI5-4 and -5).

Wage losses varied from \$0.00 to \$173,075.00. The average wage lost for OAI5-4 and -5 were \$28,763.00 and \$19,358.00, respectively. The largest contribution to this difference was the individual's salary rather than injuries.

All but two permanently disabled subjects had returned to work by the time of this survey--although some had a change of careers. The estimation of future wage losses was particularly difficult for the individuals who changed careers or were unable to achieve their initial career objectives. The higher OAI5-4 average wage loss was, in fact, due to one individual who had to change professions, resulting in a loss of approximately \$15,000 per year for the remainder of his life. There were similar OAI5-5 cases, but they were much older, i.e., they had few remaining active years. Wage losses beyond 1975 were increased three percent per year for productivity and discounted at seven percent--the method used in the DOT "1975 Societal Costs."

Five individuals were not wage earners. Two were students and not in the labor force. One was a homemaker for which we used the average dollar value of household work*. The other two were nuns for which we used equivalent wages for similar work.

*Walker, K.E., Gauger, W.H., "The Dollar Value of Household Work" Cornell University Information Bulletin 60, 1973, 11 p.

Wage losses were fully covered for five individuals, including the two nuns, who were considered self-insured. Ten people had their wage loss partially covered, and eight people had no coverage.

Medical expenses are the other major cost component. They ranged from \$2,124.00 to \$212,571.00. The OAI5-4 and -5 groups averaged \$13,925.00 and \$40,493.00, respectively. The costliest cases involved lengthy intensive care, more than one hospitalization, extensive outpatient visits, and continual medical care (e.g., quadriplegic). The least costly involved only one week of hospitalization. The major components of the medical expenses were for hospital treatment and subsequent rehabilitation therapy. Insurance provided full coverage for 14 and partial coverage for 11 other individuals.

Vehicle damage was the primary property damage loss. All but one vehicle was "totaled," i.e., not repairable, so the vehicle loss was equivalent to the cost of replacement. As noted in Section 2 (Sample Selection) the same frame of in-depth cases is restricted to recent model vehicles--less than three years old. Consequently, the vehicle replacement costs reported in these results will be biased higher than the true average. A third of the people were not traveling in their own car, i.e., the car was leased or rented, or the individual was a passenger in someone else's vehicle. Vehicle replacement costs were estimated for all cases, and the costs were distributed equally to each occupant in the eight cases with more than one occupant.

The vehicle damage costs averaged \$2,262.00 with a minimum of \$421.00 and a maximum of \$5,335.00. Results for OAI5-4 and -5 cases were similar.

Losses of vehicle contents and personal clothing or goods (minor components) were included in "other" costs. In only one case did the subject have knowledge of the damage costs of other struck objects (e.g., lawns, signs, guardrails). In this case the individual was billed

\$3,300.00 for relandscaping a front lawn of a personal residence. Since damage costs for objects struck were not generally reported, this isolated response was also placed in "other" costs.

Legal and court costs averaged only \$2,413.00 per individual and were similar for the OAIIS-4 and -5 groups. Costs averaged \$6,032.00 for the 10 individual legal suits. These costs may be low, because four individuals relied on friends, and some legal costs were covered by the insurance company's legal activities. Many people reported problems with insurance companies and legal suits. While there were some good comments about insurance companies, many were disillusioned with the legal system and insurance companies--including their own. Of the 10 legal suits instituted, nine were settled by the time of the interview. There was no hesitancy in discussing suits the subject initiated. Suits filed against the subjects were not discussed.

Other costs include incidental costs not consistently reported in all cases. These include: loss of vehicle contents/cargo (e.g., trombone), loss of personal clothing, car rental while replacing original vehicle, increased automobile insurance rates, added interest cost on outstanding bills whose principal payments had been deferred, transportation costs to accompany individual while traveling, relandscaping costs.

Family help was an important cost component in the medical recovery of every individual. While it was impractical to quantify family help in dollars, their assistance varied from 1 week to 5 years (some even continuing to this day). The extent of body trauma, the degree of physical therapy required, and the extent of disorientation were major factors in determining how long and to what extent the individual needed assistance. Those with wired jaws had to have all food specially prepared (and upon being sick, had to be rushed to the hospital so as not to choke on vomit); those in body casts (or casts

Table 8a

Financial Consequences of OAI5-4
Injuries in 1975 Dollars

CASE	LOST WAGES	MEDICAL EXPENSE	VEHICLE LOSSES	LEGAL/ COURT	OTHER	TOTAL	LOSS RECOVERY
1	3,432	4,629	5,335	4,696	220	18,312	44,053
2	0	3,101	1,323	0	33	4,457	4,424
3	5,045	15,892	421	1,174	51	22,584	24,043
4	1,530	12,744	2,480	0	39	16,793	12,650
5	5,836	9,033	2,842	0	218	17,929	17,711
6	38,246	58,512	1,035	2,885	0	100,678	66,937
7	1,377	2,124	1,508	0	244	5,253	15,056
8	1,689	9,309	2,432	100	73	13,503	12,304
9	173,075	25,430	2,443	16,826	205	217,979	71,254
10	241	2,461	1,947	0	0	4,649	4,190
11	19,067	12,185	1,163	0	29	32,444	8,503
12	95,613	11,674	1,163	0	54	108,504	20,177

Table 8b

Financial Consequences of OAI5-5
Injuries in 1975 Dollars

CASE	LOST WAGES	MEDICAL EXPENSE	VEHICLE LOSSES	LEGAL/ COURT	OTHER	TOTAL	LOSS RECOVERY
1	6,361	7,458	1,403	100	125	15,347	24,293
2	3,315	9,852	2,672	0	69	15,908	14,271
3	12,870	17,877	3,784	0	5,468	39,999	20,873
4	1,931	13,294	2,221	0	46	17,492	15,451
5	3,861	10,668	2,221	2,148	212	19,110	13,043
6	12,870	78,832	2,349	0	1,408	95,458	94,050
7	43,655	15,730	3,391	0	7,397	70,123	46,238
8	1,444	102,057	4,396	0	5,109	113,006	117,573
9	515	4,026	1,332	6,034	830	12,737	24,206
10	1,158	11,856	2,665	0	86	15,765	14,394
11	32,544	39,390	3,046	26,260	139	101,379	160,793
12	131,124	212,571	2,538	0	18,460	364,693	233,389
13	0	2,796	434	100	1,500	4,730	3,043

on many limbs) could do very little for themselves for as long as seven months; those re-learning walking or other motor movements as well as those sustaining brain injuries had to be accompanied wherever they went. Many were not allowed to drive for at least one year, and still have lapses of memory, problems with coordination, headaches, and dizziness.

Families also provided "services" such as: (1) children (young adults) moving back to parents' home and vice-versa for as long as two years; (2) family of partially disabled young man assisting in building his home; (3) taking care of children, home upkeep, providing transportation; (4) one mother caring for quadriplegic son exhaustively for one year; and (5) a daughter taking leave of work for six months to care for mother and even now having to do shopping, house cleaning, etc.

Loss recovery averaged \$43,317.00 overall for the combined OAI-4 and -5 cases or 75 percent of the average overall losses of \$57,953.00 for the OAI-4 and -5 cases. While it may seem that the OAI-5 cases averaged a higher percentage of loss recovery, the difference is due to a few unusual cases (i.e., OAI-4 case 9 and OAI-5 case 11). Some of the difference is due to the combined effect of delay in recovery and the declining value of the dollar in the interim. The large discrepancies between total loss and loss recovery were primarily in the area of lost wages and legal suits. Each will be discussed in turn.

Wage losses are not readily recovered by minors and young adults with no job security and/or fringe benefits; homemakers and students who are not paid; older persons given early retirement; and those who must change careers and receive less pay. In contrast, established wage earners (e.g., business persons) usually have fringe benefits that compensate for extended periods.

One young man (OAI-5 case 11, Table 8b) seems to have made \$60,000 by having an accident. In actuality, during the six years between the accident and the interview, he had only 2 1/2 years of employment. A midbrain contusion resulted in three months of coma

and several months of rehabilitation. The fracture of his lower jaw required extensive dental work (80 visits over a period of three years); comminuted fracture of his knee cap along with a broken ankle and arm has left him with permanent stiffness, soreness, and a slight limp. His activities are somewhat restricted, and there are occasional problems with coordination, fine motor control and dizziness. He was nearing completion of a Ph.D. at the time of the accident and hoped for a career as a musician and teacher. Whether or not he will complete his graduate work is uncertain, and his job future is equally unstable. He has held four brief jobs in the past six years, and by the time of the interview, he had spent the sum recovered.

Not surprisingly, ability to find a good lawyer can increase an individual's recovery by thousands of dollars and sometimes tens of thousands. Of the ten law suits, most were settled to the satisfaction of the victim.

Not all of those who sued were asking for large sums of money. Two sought only enough to cover medical costs not paid by their health insurance company. Another attempted to recover for lost wages. She was from a small town and stated that her lawyer seemed to lack motivation and did not work aggressively in her behalf. Her recovery did not compensate for her wage loss of \$3000.

Two individuals filed suits without hiring lawyers. In one case, the driver had already been found guilty of negligent homicide, and his insurance company paid the plaintiff the full amount of \$12,000. In the other case, the victim (who also had two children involved in the accident) felt it was an "open-and-shut" case and collected from the defendant's insurance company. Although she was later told by friends that legal counsel would have increased her recovery, she was weary of having to deal with insensitive insurance agents who were pressuring her to sign statements and preferred to settle any disputes as soon as possible. Two other individuals confided that their legal costs were lower (and recovery was higher) because a friend or relative had handled the case.

4.1.2 Functional Consequences. The functional consequences for individual cases are displayed in terms of the type of permanent physical impairment and time lost (Table 9). Time lost is expressed in terms of activity restriction, time lost from work/school, medical treatment, in-hospital stay, and medical visits. Although not tabulated, there are often additional functional consequences to the subject and his relatives that were not an immediate consequence of the individual's trauma.

Permanent Impairment continues to play a role in the health of 17 subjects. Most of these were complaints about occasional pain, stiffness, soreness, and limited movements of various joints. The more significant physical impairments resulted in the loss of recreation and job opportunities (e.g., teacher with speech slur, carpenter with fused vertebrae, dental assistant without fine motor control). One mother can talk but cannot sing or yell, which meant that she could no longer participate in the choir or raise her voice. Another subject must perform daily eye care because of a malfunctioning eye duct. Although not a major functional loss, this impairment will continue to be a time-consuming annoyance. Due to nerve injuries, one person sustained a partial functional loss of one arm, while another had an arm amputated. The most extensive impairment was a quadriplegic. Both the quadriplegic and an older person who lost her sense of coordination and balance became almost completely dependent on others for the remainder of their lives.

Head injury resulted in both functional and psychological problems. The cases of speech slur (due to a brain stem injury), loss of balance, and loss of fine motor control were mentioned above. One musician lost the ability to read notes. Another person lost his sense of smell, although he can still taste. Half (12/25) incurred head and face disfigurements, although most individuals were not noticeably self-conscious about them. The worse case resulted in two years of depression for a high school senior who had been voted "most handsome."

Psychiatric counseling was a common occurrence among those sustaining brain injuries. Young children developed a fear of cars and of losing parents. Some lost their sense of confidence because of a sense of remorse for injuries to others. These serious accidents were probable contributing factors in four couples' obtaining divorces within a year or two after the accident and one young man marrying the first person he dated after the accident.

Activity restriction is defined as the entire time span from the time of accident until the time the individual can function independently. This time includes hospital treatment, rehabilitation and home care. Clearly, most of the individuals injured to the 4- or 5-level never regained all their pre-crash functional capabilities, but they are able to live on their own. Two OAIS-5 cases (asterisk in Table 9) remained dependent on the care of others. The first case involved an aged individual who has lapses in memory, little coordination, and poor balance. Other than making her bed and folding laundry, her care is provided. The second case involved a quadriplegic.

The OAIS-4 cases averaged 16 months of activity restriction with a range of two weeks to five years. The OAIS-5 cases averaged seven months, excluding the two "dependent" cases, and 63 months if the estimated years of remaining life of these two individuals are included. For consistency one should include the percentage loss-of-function for the other 23 people multiplied by their remaining years. However, the percentage of permanent loss-of-function was not determined.

Time lost from work and/or school is expressed in calendar months. Thus, the number of months can be interpreted as people-months, e.g., 20 workdays per month, excluding sick days, holidays, and vacations. Of the 25 people interviewed, 14 were working, five were in school, five were going to school and working, and the one was a housewife. The OAIS-5 individual with poor balance did not return to work and was given an early retirement by the employer. Work time lost for the quadriplegic was based on 34 years to reach the age of 65.

TABLE 9 - Functional Consequences of OAIS-4 and -5 Cases

<u>PERMANENT PHYSICAL IMPAIRMENT</u>	<u>ACTIVITY RESTRICTION (MONTH)</u>	<u>TIME LOST WORK/SCHOOL (MONTHS)</u>	<u>SIGNIFICANT MEDICAL TREATMENT (MONTHS)</u>	<u>HOSPITAL INPATIENT (DAYS)</u>	<u>OTHER MEDICAL VISITS</u>
<u>OAIS-4</u>					
1 Soreness	4	1.5	1	12	34
2 None	2	.5	.4	8	2
3 Pain, Numbness	5	4.5	3.5	105	6
4 Stiffness	4	2	2	21	16
5 Amputee (arm)	3	3	1	14	8
6 Speech slur	24	24	24	140+	53
7 Soreness	.75	1	.5	7	19
8 None	24	2.2	1	21	6
9 Pain, Stiffness	48	48	48	75	90
10 None	.5	.25	.25	4	2
11 Pancreas Loss	11.67	8	12	35	16
12 Aggravated Parkinsons disease	60	24	60	35	70
<u>OAIS-5</u>					
1 Arm function loss	14	14	2	42	19
2 Stiffness	3	3	2	27	15
3 Soreness	10	10	8	42	19
4 None	5	4	4	90	7
5 Eye duct care	12	7	2	30	3
6 None	24	3	2	42	4
7 Poor balance*	252	60	9	90	67
8 None	4	4	36	35	107
9 Fine Coordination	2	2	2	28	27
10 Less strength	4	3.5	4	56	2
11 Limp	6	24	5	120+	110
12 Quadraplegic*	480	408	24	250+	life
13 None	1	1	.5	11	2

*Life expectancy estimates used for two cases of significant permanent physical impairment.

+Excludes an additional 7,30,70 inpatient days respectively for rehabilitation/physical therapy.

The OAIS-4 cases averaged ten months of time lost from work/school with a range of one week to four years. The OAIS-5 cases also averaged ten months, excluding the quadriplegic, and 42 months including all 13 cases.

Significant medical treatment covers the time period of active professional medical care, including hospital in-patient days, rehabilitation, major physical therapy, and significant follow-up treatment. Many of these people still return for periodic checkups or must continue a routine of personal medical care (e.g., daily eye care for malfunctioning eye duct). The routine or health maintenance activities have not been included. The average number of months for OAIS-4 and -5 cases was 13 and 8 months respectively, with a range of one week to four years.

Hospital inpatient days averaged 40 for OAIS-4 cases and 66 for OAIS-5 cases. The three cases tagged with a plus sign involved additional inpatient days (7, 30, 70 respectively) for rehabilitation/physical therapy. Including these added days increases the average number of hospital inpatient days to 52 and 74 for the OAIS-4 and -5 cases.

Other medical visits include visits as an outpatient or to a physician's office for treatment or rehabilitation. Routine or periodic visits following active treatment are included. The OAIS-4 cases averaged 27 visits, while the OAIS-5 cases averaged 29 visits, excluding the quadriplegic, who is permanently confined to long-term hospital care.

Secondary functional consequences often (8/25) followed in these serious accident--both to the subject and his relatives. Some problems were a direct result of the crash injury, e.g., meningitis from infected bone fragments, kidney problems, and eye hemorrhage. Others resulted from the subsequent disabilities, e.g., an older woman who, because of reduced coordination and poor balance, slipped and broke her hip. The subjects' relatives also suffered. For a year one mother provided her invalid son with extensive care under tremendous strain--compounded by her son's resentment. She suffered a heart attack and was

hospitalized for a month at a cost of \$15,000.00. Another woman was put on tranquilizers as a result of her husband's accident. Unknown to her or her physician she was two weeks pregnant and gave birth to a child with a birth defect. The child ultimately died.

Clearly the losses due to induced physical health problems are real ones in serious accidents. It is difficult to establish a deterministic link between serious injuries and subsequent health problems, e.g., possibly the heart attack was destined to occur anyway. While it is difficult to quantify these losses in terms of cost, it is hard to ignore them.

4.2 OAIS-6 to -10; Years of Life Lost.

The years of life lost (life expectation) and age at date of accident for 20 fatalities are summarized in Table 10. Life tables* within one year of the accident for white males and females were used in determining the life expectation in order to account for changes in mortality statistics.

An average of 42 years of life were lost for the 20 randomly selected cases of OAIS-6 through -10 cases. Each of these subjects passed the sample selection screening criteria (e.g., occurred in Washtenaw County), and each died within 24 hours of the accident. Since 80 percent (16/20) of the fatalities were males, the results may be biased downwards.

TABLE 10

Age and Life Expectation of 20 Fatalities at Time of Accident					
	<u>MEAN</u>	<u>STD.DEV.</u>	<u>MEDIAN</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>
Age (years)	31	20	24.5	1	65
Years Lost	42	18	46.8	13	68

4.3 OAIS-1 to -5 Summary of Financial Consequences.

A summary of financial consequences from the Flora OAIS-1 to

* Vital Statistics of the United States, Volume II Part A - Mortality, National Center for Health Statistics, Rockville, Maryland, 1976.

-3 study and current OAIS-4 and -5 pilot studies is **displayed** in Table 11. All costs have been adjusted to a common base of 1975 dollars. The mean, median, minimum, and maximum are tabulated for each cost component. Corresponding cost components from the DOT 1975 Societal Costs of Motor Vehicle Accidents have also been included for comparison. Neither this pilot study nor the DOT study included any fatalities in this OAIS-1 to -5 range. The original Flora and DOT results are included as Appendices A and B.

Considerable caution should be taken in interpreting these means due to the limited sample, low overall response rate, and limited representativeness of Washtenaw County. The wide differences between the mean and median for wages loss and most medical costs suggests skewed data, i.e., not a normal distribution. It is interesting to note that all the means (except OAIS-4 wages) are monotonically increasing with increased injury severity.

The DOT production-market (wage) losses are fairly similar for OAIS-1 to -3 but are considerably higher for OAIS-4 and -5. The DOT production losses for OAIS-1 to -3 were derived using average work-loss days, while OAIS-4 and -5 losses were derived using average percentages of permanent impairment, i.e., 25 percent impairment for all OAIS-4 cases and 57 percent for OAIS-5. While the actual percentage of permanent impairment was not investigated in the current study, only 4 cases out of 25 would have equalled or exceeded the DOT average impairment percentages. While permanent physical impairment is the norm for OAIS-4 and -5 cases, we did not observe the level of severity projected by DOT.

In contrast to the higher wage losses, the DOT medical costs are considerably lower for OAIS-3 to -5. Besides different methods of computation, there may be a real difference in the severity of injury in the two sets of study data. For example, the number of hospital in-patient days for OAIS-3 to -5 in this study averaged two to three times the DOT hospital days.

The two-to-one difference in OAIS-1 costs is also significant because of the proportionately large number of OAIS-1 cases. This

difference is due primarily to a difference in vehicle damage estimates. The Flora average of \$885 is likely high because only late-model cars in a relatively affluent county were included in the sample. On the other hand, all vehicle damage in this study was divided by the number of occupants in each car and attributed equally to each occupant. On a per-vehicle basis, the OASIS-1 vehicle damage costs were almost identical to the DOT average. While the DOT results are used on a per-occupant basis, it is not clear if the OASIS-1 vehicle damage was or was not derived on a per-occupant basis. If the DOT OASIS-1 vehicle costs were derived on a per-occupant basis, the two-to-one difference may be due to biases in the two sets of study data. For example, it is possible that a significant number of minor vehicle damage incidences are not reported to insurance companies and hence are not included in the DOT analysis of insurance claims for OASIS-1 cases.

Table 11

Summary of OAI5-1 to -5 Financial Consequences in 1975 Dollars

		5	4	3	2	1
Wages Lost	Mean:	19,358	28,763	1,346	505	47
	Median:	3,861	4,239	541	361	0
	Minimum:	0	0	0	135	0
	Maximum:	131,124	173,075	5,534	1,203	782
	DOT-Market:	126,650	55,550	1,645	865	65
Total Medical Costs	Mean:	40,493	13,925	4,424	850	117
	Median:	13,294	10,492	3,849	636	38
	Minimum:	2,796	2,124	1,819	229	0
	Maximum:	212,571	58,512	8,922	1,819	1227
	DOT-Market	17,345	7,450	1,620	615	100
Vehicle Damage	Mean:	2,496	2,008	2,184	1,507	885
	Median:	2,538	1,728	3,140	1,256	0
	Minimum:	434	421	0	754	0
	Maximum:	4,396	5,335	5,024	1,758	3014
	DOT-Market:	3,990	3,960	2,920	1,865	1595
Legal and Court Costs	Mean:	2,649	2,132	*	*	--
	Median:	0	0	--	--	--
	Minimum:	0	0	--	--	--
	Maximum:	26,260	16,826	--	--	--
	DOT-Market:	1,645	1,090	770	150	140
Other Reported Costs	Mean:	3,138	97	--	--	--
	Median:	830	53	--	--	--
	Minimum:	46	0	--	--	--
	Maximum:	18,460	244	--	--	--
	Total Costs	Mean:	73,418	46,924	7,568	2,497
Median:		19,110	18,121	5,972	2,443	68
Minimum:		4,730	4,457	2,569	1,775	0
Maximum:		364,693	217,979	16,313	3,382	4327
DOT-Sub:		149,630	68,050	6,955	3,495	1900
Number of Responses: **		13	12	9	5	20

*Unknown but not zero

**CAUTION: Due to limited sample size and representativeness, skewed data and large variability, the results presented in this report are illustrative only. No inferences to other populations seem appropriate.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The primary objective of this study was to develop a methodology for collecting cost data by means of direct interviews with seriously injured accident victims. This clinical approach has been moderately successful, and a similar approach is here recommended for larger and more (nationally) representative samples. In this section we offer comments on methodology appropriate to a larger study. These comments are organized in the following five sections:

1. Sample selection
2. Data collection procedures
3. The data collection instrument
4. Other financial consequences
5. Psychological consequences

5.1 Sample Selection

The data collected in this pilot study of Washtenaw County is clearly not typical of the nation, and it would be dangerous to extrapolate the results presented here to any larger population. The National Accident Sampling System (NASS) provides a possible framework for the methodology developed here.

Although stratification and weighting at the local level within NASS have not yet been specified, it is clear that there would be some gain (for the development of cost information) in stratifying so that approximately equal numbers of cases at each OASIS level would be obtained. The range of costs in each of the OASIS levels reported here is large, and this suggests that a large sample would be needed to achieve the precision needed for cost-benefit analyses. The procedures of NASS^{*} for minimizing missing data and for precise data collection should be useful adjuncts to the present problem.

* NASS is being preceded by the current NCSS (National Crash Severity Study) which is collecting medical treatment (e.g., first aid), the number of outpatient visits, days of activity restriction, long term disabilities, and surgical procedure codes. No cost values are being collected in NCSS at present.

5.2 Data Collection Procedure

The procedures for data collection involved both locating and subsequently interviewing the selected subjects. It seems likely that our experiences (as discussed in section 3) can be viewed as typical of any future study. In particular, locating subjects proved to be much more difficult than eliciting interviews. The location problem may have been exaggerated because the local population contained so many mobile (college age) people.

An alternative plan for locating subjects is recommended--specifically that of collecting information as soon as possible after the accident and following up on a regular basis (e.g., each six months) until all reportable costs had been incurred. Ideally this could be done in conjunction with an on-going field accident investigation program such as NASS in which the subjects had already been located and contacted. This approach should improve the overall response rate, and the survey costs should be reduced appreciably.

A telephone call is an effective technique for making initial contact; the purpose of the call was to explain the project and to establish an interview appointment with the subject. Telephone calls were also made for cases in which the initial contact was made by mail in order to further explain the project and to set an interview time. The explanation of the project provides the opportunity for "informed consent" by the subject.

The personal interview in this study was regarded as an effective data collection technique because of the extent and detail of the information collected. Most frequently the interviews were conducted in the subject's home, but the opportunity of meeting at other locations (e.g., over lunch) should also be provided. In a few cases telephone interviews proved to be nearly as useful, and these should be offered if a personal visit cannot be arranged. If requested the subject should be mailed or supplied with a written description of the study and/or outline of the desired data. The latter permits the subject to be better prepared, and it is essential for structured telephone interviews.

5.3 Data Collection Instrument

The structured interview form (Appendix D) proved satisfactory for interviewing OAIS-4 and -5 subjects, although some improvements in the sequence of questions are desirable.

There is a need to ask a different set of questions depending on the OAIS level. For example, "funeral expense" is not an appropriate question for OAIS-0 or -1 subjects, while "disability" is not an appropriate question for fatalities. Thus it would be useful to have several different forms to be used according to the subject's injury level, perhaps one for OAIS-0 to -3, another for OAIS-4 and -5, and a final one for fatalities. While the forms developed under this program were used for structured interviews both in person and by telephone, they are not judged appropriate for mailing to respondents. Because of the limited number of cost components involved the possibility of developing a mailed form for OAIS-0 (and perhaps OAIS-1) subjects should be considered.

As discussed in Section 3, several auxiliary forms and letters were used in this study. These are presented in Appendix C as examples, although the exact wording of forms in a future study should be tailored to that effort.

5.4 Other (Direct and Indirect) Financial Consequences

Essentially the only costs collected in this study were the direct costs to the accident victim. Many indirect costs (such as insurance administration) cannot be determined on a clinical interview basis. The determination of what cost components are appropriate depends on the application of the results, and the possible range of applications has not been addressed in the present work. It would seem possible to design a joint survey to collect individual direct costs from a clinical study while using indirect aggregate data to develop other costs not known by the accident victim (the costs of police accident investigation, traffic delay, repair/replacement of struck objects, etc.). It was anticipated that the latter item (repair of struck objects) might be learned from the clinical study, but although many accidents involved such property damage, only one person interviewed had actually been billed for such damage.

Other cost definition problems of the present study included wage losses for non-working parents, students, and children. We have sometimes used "time" rather than "cost" as a measure of loss--for example, the days of activity restriction rather than the lost wages. This problem becomes particular acute for fatalities--e.g., deciding what wage loss to assign to a deceased female high school senior.

5.5 Psychological Consequences

The psychological consequences of severe injury and death are borne by relatives of the injured or fatal victims, and there is not a convenient scale available for measuring these. We have done little more in this study than to report some anecdotes of such effects, and to note that in fatal cases several years old the rekindling of thoughts about the accident inhibited free discussion with the interviewer. We note that these consequences of severe accidents are very real, and that a full understanding of this requires development of a measurement scale.

There have been any number of psychological studies on the phenomenon of the dying patient and their relatives/friends, but few studies of the phenomenon of sudden, unexpected death caused by accidents or other factors such as cardiovascular disease - particularly on the impact of survivors. Working with the bereaved remains an "art." Flesch did conduct a systematic study of four follow-up interviews with survivors.* The final interview, one year after the death, was concerned with anniversary reactions. No studies concerning the longer term (e.g., over 2 years) impact of sudden death on survivors was found.

* Flesch, R., "A Guide to Interviewing the Bereaved" Journal of Thanatology V. 3, pp. 93-103. 1975.

APPENDIX A
"THE FINANCIAL CONSEQUENCES OF AUTO ACCIDENTS"

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THE FINANCIAL CONSEQUENCES OF AUTO ACCIDENTS

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INTRODUCTION

This article presents the design and results of a 1974 HSRI pilot study of personal and financial costs to automobile-accident victims. The study was designed to determine the feasibility of obtaining data from a defined sample of a population of accident victims through telephone interviews and mailed questionnaires, and to assess the quality of the information obtainable from such a survey.

Previous attempts to estimate losses of automobile-accident victims have suffered from several problems: (1) the wide range of reported estimates has resulted in a lack of their acceptance; (2) in many reports, the estimated average costs have not been based on a well-defined sample of automobile accidents; (3) many estimates have lacked detail, and typically have consisted only of gross averages of total costs for fatal accidents, injury accidents, and property-damage accidents.

More precise data have numerous uses. Separate cost estimates in several categories (e.g., emergency medical costs, hospitalization and other medical costs, lost wages) would aid persons planning medical care facilities, insurance programs, and the like. Further, estimates that would be widely accepted – by government, insurance companies, and manufacturers – could form the basis for more precise cost/benefit analyses of the potential value of any proposed safety feature or program. Such cost estimates would need to be specifically related to injury severities, because safety devices reduce the severity of accidental injuries but do not eliminate all of them. Consequently, it would be most useful to have separate cost estimates for various accident severities. Valid cost estimates for each injury severity could be combined with estimates of the distribution of the accidental injury severities to obtain figures for average costs as desired.

This study used a well-defined sampling approach to determine the feasibility of its application to a defined although somewhat special population. The results and conclusions presented are necessarily restricted to this population, but the methodology developed and the preliminary estimates could be used in a larger study to estimate the costs of accidents for other populations of accident victims.

THE POPULATION STUDIED

The accident cases studied in this pilot survey were randomly selected from the files of Dr. Donald Huelke, professor of anatomy at the University of Michigan, who

has been investigating injury accidents in Washtenaw County, Michigan, for several years. For the past five years, his investigations have been focused on crashes that involve American-manufactured cars less than three years old, and that result in an injury serious enough to require hospital treatment. The cases included in the pilot survey were restricted to victims of accidents that occurred between April 1, 1972, and April 1, 1973. This restricted time was selected with the idea that those accidents were recent enough to afford a good chance of identifying the victims, yet would have occurred long enough ago that most of the results and costs would have been settled.

SELECTION OF THE SAMPLE

A table of random numbers was used to select a random sample of twenty persons who had sustained an injury classified on the Abbreviated Injury Scale as a "1" injury. An independent sample of twenty persons with an AIS injury of level "3" was also drawn. At a later point in the study, an additional sample of twenty individuals with an AIS of 2 was also drawn. The names and addresses of the individuals in the sample cases were determined from the case files, and attempts were made to contact these individuals to obtain the information desired. In cases where the victim was a child, the information was sought from a parent or guardian.

The Abbreviated Injury Scale (AIS) is a scale developed by Dr. John States and an ad hoc committee of the Society of Automotive Engineers for summarizing injuries according to severity.* The procedure for determining the overall AIS is as follows. Each injury is classified according to type (e.g., fracture or laceration), location (e.g., face, forearm), and severity (e.g., length of laceration, simple or compound fracture). Then, the injury characteristics are compared with a set of guidelines, determining the AIS code.

THE SURVEY

A preliminary questionnaire instrument for the survey was developed. The assumption early in the study was that all information would be obtained from a personal interview – or, if that were not feasible, by a phone interview. The expectation was that only a small portion of the responses would be obtained by mail – that is, from a

*Harold A. Fenner, Jr., "Development of a Medically Acceptable Injury Scale," *Proceedings, Collision Investigation Methodology Symposium*, Warrenton, Va. 1969, pp. 632-653.

respondent-completed questionnaire. However, it became evident during this study that some portion of the responses in any large-scale survey of accident victims may need to be obtained from a mail survey only, without any personal interview. In view of this, the survey instrument and associated instructions used in this pilot survey would need substantial revision to improve their comprehension to a person filling out the questionnaire on his own.

In the questionnaire, several different costs were sought as separate items, so that they could be used to calculate separate averages for the estimates. For example, the medical costs were separately categorized as ambulance service, hospitalization, physician, ancillary services, drugs, and special equipment. Wage loss was asked for specifically, and time lost from usual occupation – e.g., work, school, or housework – was also sought in order to provide estimates on a common ground. The presence and degree of any permanent impairment or disfigurement was also investigated. Incidental costs, such as substitute transportation or extra child care, were also included. Intangible costs, notably pain and suffering, were not sought in the questionnaire. To determine the proportion of costs recovered by medical or automobile insurance or recovered through legal action, the source of payment of each cost was sought.

RESPONSE RATES

The response rates obtained were: 65% of the AIS level-1 injuries, 25% for the AIS level-2 injuries, and, to date, 45% for the AIS level-3 injuries. It is expected that additional responses from the AIS level-2 sample will be obtained. However, this sample was selected considerably after the first two, and only mail responses were solicited, so a somewhat lower response rate may result. Table 1 summarizes the response experience for the three samples in terms of the type of interview obtained.

The number of subjects reported in Table 1 is larger than 20 in the AIS-1 and AIS-3 groups. This is because occasionally several family members received the same severity injury in one accident. When this occurred, data were obtained separately on all persons injured in the accident and living at the address where the interview was conducted. This additional data, obtained with negligible additional effort, provided data on slightly more individuals

and tended to improve the quality of the data overall, since it avoided possible confusion about which member of the family sustained which costs, and also elicited better cooperation from the subjects.

The effect of this procedure was to change the type of sampling. Initially, a simple random sample of injured persons within injury categories was contemplated. The result is, instead, a cluster sample within injury categories. The major effect of this difference would be to change the variance estimates. From these preliminary results, it appears that the distinction may only be important for the AIS-1 category. The difference in the other categories is much smaller. From the practical point of view, the cluster sampling may be the more efficient, since the major effort seems to be associated with the location of the subject and the interview. Additional persons may be included in the interview at a negligible cost.

The most serious problem in obtaining responses was locating the individuals. A surprisingly large proportion of the accident victims either had no telephone or had an unlisted number, had changed their place of residence without leaving a forwarding address, or had given a fictitious address initially. Approximately 20% of each sample was found to be unlocateable (the specific proportions were 25%, 20%, and 20% for the AIS-1, -2, and -3 levels, respectively). These rates of nonresponse could have injected certain biases into the survey results. For example, those persons who were unlocateable may have consisted largely of students, who, being younger, may have had more or less costly injuries. For example, their wage loss may have been less, due to a lower salary rate.

Investigation of the ages, sex, and other characteristics of the non-respondents was limited because of the small numbers involved. No obvious differences between respondents and non-respondents were found, probably due to the small numbers involved. The range in ages was about the same for both respondents and non-respondents. There were no female respondents in the AIS-2 group but over all groups no difference in response rate by sex was evident.

The other non-respondents – who were located but refused to participate – may represent other potential biases. The persons who refused may have done so because of pending litigation or concern for the possible assignment of fault. There was some reluctance to talk about accidents which involved serious injury, perhaps as a result of guilt

Table 1. Response Rate by Type of Data Collection.

AIS Category	Personal Interview	Number Responding to		Number Not Located	Number of Non-Responses	Number of Subjects
		Telephone	Mail			
1	6	5	9	5	4	29*
2**	–	–	5	5	10	20
3	3	0	6	4	9	22

*One subject had died of causes unrelated to the accident.

**Only mail interviews were attempted.

feelings. At any rate, the non-respondents may differ from the respondents in demographic or socio-economic variables, or in the types of injuries they sustained. Some information regarding possible differences can be obtained from the files on exact type of injury and body part affected, and also on age and sex. No notable differences were found, although the very small sample sizes preclude any firm conclusions.

RESULTS OF THE PILOT STUDY

The data from the various groups are summarized in Table 2, which presents four data items: total medical cost, wages lost, property damage loss (vehicle), and duration of activity restriction. Although the questionnaire was designed to provide finer data divisions, particularly of the medical costs, for the most part the small sample sizes resulted in too few entries for most of the finer subdivisions. One exception was the cost of ambulance service. This cost was reported by all of the AIS-2 and -3 respondents, and by 70% of the AIS-1 respondents. The cost was usually \$15 or \$30, but in one case was \$50. The few persons who did not indicate any cost due to ambulance service usually reported that they rode to the hospital with a friend. Thus, it would be reasonable to assign them a small cost, even though they did not pay it directly.

As would be expected, all data elements showed a tendency to increase with the increasing AIS category. The mean total costs to the individuals were \$764, \$1942, and \$5885, respectively, for AIS-1, -2, and -3 groups.* The

mean length of activity restriction was 4 days, 30 days, and 106 days, respectively. The losses to individuals in the AIS-1 category were quite skewed, with the major loss usually the damage to the vehicle. Most of the medical costs among the AIS-1 victims were relatively small; the median was \$30. However, occasionally large losses were encountered. In the sample, one person required nearly \$1000 worth of dental work. Typically, the major medical cost among the AIS-1 group was transportation to the emergency room and the use of emergency room services. In the other two categories, this was a negligible part of the medical expense.

AIS-1

Persons who were included in the sample of AIS-1 victims were the easiest to locate and were the most cooperative in providing information. As a result, there is more information on this group, and it tends to be of higher quality than for either of the other groups. Thirty percent of those interviewed reported no medical costs whatever associated with the accident, even though in some cases they did report "riding to the emergency room with a friend" and "being looked over." Consequently, there is probably a slight bias toward underreporting of medical costs here. All of these individuals did go to a medical facility and did undergo some kind of an examination. Thus a minimum transportation charge and a minimum emergency room charge is probably the true minimum, rather than zero. If only those who reported some medical expense are included in the average, the mean changes from \$92 to \$131 for total medical expense. On the other hand, the sample included only those AIS-1 injuries which did receive some medical attention. The total population of AIS-1 injuries probably has an even smaller average medical cost. For these persons, the majority of the total medical cost was the transportation and examination. The costs did range up to nearly \$1000, however, indicating that these

*One person in the sample of AIS-3 injuries refused to supply information on wage loss. He did lose 16 months from work, so his wage loss must have been substantial. At the minimum wage it would have been \$6300; at the mean wage for the area it would have been \$18,700. Inclusion of these values would raise the mean total loss for AIS-3 to \$6912 or \$8281.

Table 2. Summary of Costs Reported by Respondents

AIS Category	Number of Respondents		Total Medical Cost	Wages Lost	Property Damage Costs	Total Cost	Activity Restrictions
1	20	Mean:	\$92	\$39	\$705	\$764	4 days
		Median:	\$30	0	0	none	
		Range:	\$0-\$965	\$0-\$650	\$0-\$2400	\$0-\$3365	0-44 days
2	5	Mean:	\$660	\$420	\$1200	\$1942	30 days
		Median:	\$500	\$300	\$1000	\$1900	30 days
		Range:	\$180-\$1430	\$112-\$1000	\$600-\$1400	\$1380-\$2630	21-50 days
3	9*	Mean:	\$3478	\$1119*	\$1739	\$5885	106 days
		Median:	\$3065	\$450*	\$2500	\$4644	56 days
		Range:	\$1430-\$7014	\$0-\$4600*	\$0-\$4000	\$1998-\$12,685	4-450 days

*One person refused to supply data on wage loss, but did indicate a loss of 16 months of work. The total cost and the wage loss are based only on the 8 individuals supplying complete information.

data may be quite skewed. The largest bill was due to damage to teeth, requiring extensive bridge work. All persons reported recovering 100% of their medical costs from some form of insurance.

Wage loss among the AIS-1 individuals tended to be minimal. Most did not lose any time from work, and some were not gainfully employed. Only four persons reported any loss, and those losses ranged from \$24 to \$650. Averaged over all victims, the mean is \$40; averaged over only the four who reported a loss, the mean is \$200. The job status of the victim and the day on which the accident occurs -- even the time of day -- appear to be important determinations in the wage loss for this group. All four persons who reported wage loss also reported that they recovered it either through sick leave or through workman's compensation.

The damage to the vehicle was typically the largest dollar loss among these persons, though not all persons sustained this loss. Slightly over half were riding in someone else's vehicle at the time of the accident. However, to arrive at an average cost per occupant, the cost is distributed over all occupants in the vehicle involved in the accident. The mean of the reported damages was \$1567. However, the mean damage cost per victim was only \$705. Note that the file from which these cases were sampled is a file of accidents involving late-model cars. At the time of the accidents, the cars involved were no more than two years old. This vehicle-selection bias produced an abnormally high damage figure.

Activity restrictions resulting from these injuries tended to be mild and not of long duration. Slightly over half the victims reported no activity restriction. Those who did usually reported a restriction due to sore muscles. The average duration of activity restriction was 10 days; the average over all persons was 4 days.

The mean total cost for these persons was \$764. However, the median total cost was only \$53, indicating that most AIS-1 injuries result in a small total cost, while a few result in rather large costs. The range in total costs was from \$0 to \$3365. In general, the small costs were associated with persons who sustained no property-damage loss; the large costs were incurred by individuals whose vehicle was damaged. Medical costs were usually confined to transportation and examination. The major portion of the total cost tended to be vehicle-related.

AIS-2

The data from the AIS-2 group were not of as high quality as those from the other two samples. The primary reason for this appears to be that this sample of accident victims was approached only by mail. The questionnaire used was the same preliminary version designed to be used by an interviewer. Consequently, respondents misunderstood some questions and failed to answer others. To some extent this can be improved by a questionnaire designed for

a mail survey. However, there will probably still be a tendency to obtain less complete information, particularly on dollar items such as wage loss, or dollar value of loss of an automobile. These are somewhat sensitive items for some persons.

Two of the five AIS-2 victims instituted suit to recover losses. Both cases were settled out of court in favor of the plaintiff. The accident victims received two-thirds of the settlement amounts, the other third paid legal fees. All of the individuals who did not institute suit (3 out of the 5 returns to date) incurred some cash loss because their lost wages were only partly covered by sick leave or some form of insurance. All individuals in this sample received insurance or other payments to cover medical expenses and damage to their automobile. However, the two persons who did institute suit had to pay some or all of their medical expenses first, then recover them in the settlement, which also included amounts for "pain and suffering" or "inconvenience" over and above the actual medical and legal costs.

All of the AIS-2 victims sustained substantial medical costs. The mean medical cost was \$660 and the median was \$500. The costs reported ranged from \$180 to \$1430. Thus there is some indication that medical costs in this group will be somewhat skewed, but not as much as were the costs in the AIS-1 group. Ambulance costs tended to be only a minor component of the medical costs in this group; the treatment or hospitalization cost was the major expense. All respondents reported that all medical costs were covered by insurance.

All respondents reported some wage loss. Only the two who instituted suit recovered all of the lost wages. The losses out of pocket for the others ranged from \$112 to \$333. The total wage loss ranged from \$200 to \$1000, with a mean of \$420 and a median of \$300. Interestingly, one individual claimed to have received 335% of his lost wages from sick leave, private income insurance, workmen's compensation, and other sources, over and above the compensation resulting from the settlement of the suit.

Somewhat surprisingly, the losses from vehicle damage among the AIS-2 victims were slightly less per damaged vehicle than among the AIS-1 victims. The average loss per victim was greater, however. Vehicle damage losses reported ranged from \$600 to \$1400, with a mean of \$1200 and a median of \$1000. The accident victims reported the amount of their insurance settlement as the amount of damage. However, such responses to the question concerning vehicle damage loss as "... totaled; \$1200..." indicate that these reported values may be low, because they are presumably for cars no more than two years old.

Activity restriction ranged from 21 to 50 days, with the mean and median both being 30 days. The total monetary loss for these accidents ranged from \$1380 to \$2630. The mean total loss was \$1942 and the median total loss was \$1900. Thus there is some indication that, at least for total cost, the data may be fairly symmetrically distributed in this group.

AIS-3

All persons in this group had extensive medical costs. The emergency service was negligible in relation to the total bill. Medical costs ranged from \$1430 to \$7014, with a mean cost of \$3478 and a median cost of \$3065. Here again it appears that the data may be reasonably symmetric rather than skewed.

Of the nine responses from this group, four reported no wage loss and one person refused to answer the question. Among the losses reported, the range was from \$900 to \$4600, with a mean of \$2238 and a median of \$1725. The person who refused to answer this question did report a loss of 16 months from work. At the minimum wage this would have resulted in a loss of more than \$6300. At the mean wage for this area, this loss would have been about \$18,700. Inclusion of either of these values would have substantially increased the average loss per victim. Excluding the refusal, the average wage loss per victim was \$1119. One of the persons reporting zero wage loss was a child; another was a student. Assigning a value to time of activity restriction may be a better measure of loss than "wage loss," since some of the injured persons were non-working mothers or children.

Vehicle damage losses averaged \$1739 per victim in this group, with three persons reporting no loss. The damage per vehicle ranged from \$1650 to \$4000, with a mean of \$2608. Activity restriction ranged from 2 to 64 weeks, with a mean of 15.2 weeks and a median of 8 weeks.

Total cost per victim ranged from \$1998 to \$12,685, with a mean of \$5885 and a median of \$4644 if the one refusal to report wage loss is excluded. If a minimum wage is assumed and included, the mean increases to \$6912 and the upper limit of the range increases to \$15,130, with even larger increases if the person who refused to answer earned substantially more than the minimum wage.

The results of this pilot survey must be viewed with caution. First of all, they cannot claim to represent anything more than a rather special area. Secondly, the accidents from which the sample was drawn were restricted to late-model vehicles. This could have had at least four effects. First, the costs of vehicle damage are probably somewhat larger than if all model years had been included, since costs for older cars are limited by the total worth of the car, which declines rapidly with age. Secondly, it is possible that injury severity may be associated with model year, or age. If this is so, the restriction to late-model cars may have resulted in a different set of injury severities or even different severities within the AIS categories. Thirdly, late-model cars tend to be associated with persons in higher economic status. This would tend to increase the loss due to lost wages, since these persons would tend to earn more per day. Finally, the ages of persons driving or riding in late-model cars may differ from those of the general population. Older persons are more susceptible to injuries. The older a person is, the longer the recovery time from an injury of a given severity. If older persons were overrepresented, the medical costs would be too high. The

oldest persons in the sample were in their sixties. Thus, it is possible that too few elderly persons occupy new models, raising the possibility of an underestimate of average medical cost.

Washtenaw County, where all of these persons were treated, has a high cost of medical care. Medical costs, particularly in the AIS-2 and -3 categories, would probably be substantially different in different geographical areas. The fact that most losses were covered by insurance — either health, car, or employment — is also rather unusual and reflects the affluence of the community, or perhaps that persons who drive late-model cars are more likely to be insured.

In spite of the limitations of the data, a comparison with other reported costs for injury accidents is interesting. NHTSA has used an estimate of \$7300 per injury, the NSC has estimated a cost of \$3100 per injury, and the RECAT report estimated a cost of \$2750 per injury.* These figures can be compared to the estimated costs per injury in the three AIS categories found in the pilot study: \$764, \$1942, and \$5885.** There are two additional AIS categories, for injuries more severe but not fatal (within 24 hours), which are not included and which would presumably have higher costs. However, injuries in these categories are relatively rare, and as many as 40% of persons initially categorized as having these severities of injuries eventually die as a result of the injuries. Those individuals would be included in the cost estimates for fatalities rather than for injuries. To get an average cost per injury, averaged over severities, the average cost within each severity must be weighted by the frequency of that severity to form a weighted average of all injuries. If this is done with the injuries in the file which was sampled, the resulting average cost per injury is \$1198. This is somewhat too low, because 2.6% of the non-fatal injuries were not included (the AIS-4 and -5). However, about 40% of these were eventually fatal and would not be included. Thus, even if the costs for these categories are substantially higher than for the first three, the mean injury cost would not be much affected.

The Huelke file, which was used as the population for the sample, has a bias toward more severe (towaway) accidents than does the general population of towaway accidents in the County. For the most part, Dr. Huelke's cases are limited to those crashed vehicles from which at least one person was transported to a hospital. A current study, based on a statistical sample of towaway accidents, shows a distribution with a lower proportion of severe accidents. Table 3 presents these two distributions of injury severity in towaway accidents. If the current distribution is used to calculate the weighted average, the result is \$970 per injury, with less than 0.6% of the injuries not included.

*Need to Improve Benefit-Cost Analyses in Setting Motor Vehicle Safety Standards, B-164497 (3), Report to the Committee on Commerce, U.S. Senate, by the Comptroller to the U.S., Washington, D.C., July 1974, p. 10.

**These costs include property damage.

HIT LAB Reports

Table 3. Injury Severity Distributions, Excluding Fatalities and Non-Injureds (AIS-0) in Percent

Population	AIS					Proportion of total file injured
	1	2	3	4	5	
Washtenaw County Tow-aways 1970-1973	80.6	10.3	6.5	0.8	1.8	62.1
HSRI Restraint System Study Washtenaw and Oakland County 1974-1975	89.1	8.1	2.2	.5	.1*	55.0

*To date, no persons have received a 5-level injury; however, data collection is continuing and so the proportion has not been estimated to be zero.

This mean cost per injury is considerably below the estimates that have been used previously by the NSC, NHTSA, and RECAT (\$3100, \$7300, \$2750). This could be due to the fact that no information is included on the total cost of the most severe non-fatal injuries – those in the AIS-4 and -5 categories. It is interesting to calculate the total average cost per injury required in order that the weighted average would be as large as those previously estimated. This results in extremely large costs for the AIS-4 and -5 level injuries: \$329,629 to give the RECAT estimate, \$394,444 to give the NSC estimate, and \$1,172,178 to give the NHTSA estimate. These are extremely large values – larger than the costs estimated for fatalities. It seems unlikely that the average costs for the AIS-4 and -5 injuries are this high, although it is expected that they would be substantially higher than the AIS-3 costs. The AIS-4 and -5 injuries would include some amputees, as well as paraplegics, quadraplegics, severe brain damage, etc. For some of these, the costs associated with the injury would be extremely high, and would exceed the cost of a fatality. Such severe cases are rare, even among the AIS-4 and -5 classifications, however, and it is unlikely that the average cost would be that high.

The above considerations point out a discrepancy between this study and previously published surveys: the previous cost estimates are much larger. To some extent, this may be due to the fact that previous estimates included costs which are not included here (e.g., intangible costs). The estimates arrived at here are the results of a very small feasibility survey. They are in no way definitive. The small sample sizes preclude any firm conclusions, although the differences in the estimates are unlikely to have arisen strictly through chance.

Finally, the differences may be due to a lack of sensitivity in the previous studies to the different injury severities. If the cost for an AIS-3 injury were taken as the average cost per injury, the result would be in reasonably good agreement with the figure used by NHTSA, particularly if an estimate for the refusal is included. However, the number of AIS-3-level injuries is much smaller than the total number of non-fatal injuries: it is no more

than 3% of all nonfatal injuries. We feel that the differences are mostly due to a different severity of injury. There is a need for further work to resolve the differences and to provide an estimate which could be widely accepted.

Need for Further Study

Several aspects of this pilot survey indicate areas for further research. The survey instrument needs revision. This is particularly true if it is to be used in part as a mail survey. The best information is available from a personal interview, which is viewed as the most desirable data collection method. However, this may be supplemented by a mail survey to investigate non-response.

The optimal time after an accident to wait before collecting the data remains an open question. The difficulty in locating the persons in the sample indicates that the 1- to 2-year lapse used here may be too long. On the other hand, two cases in the total sample were still involved in litigation. This complicates data collection and increases the refusal rate. Sufficient time must also be allowed for recovery from injuries in order to determine the total costs. Perhaps the best plan would be collect information as soon after the accident as possible to ensure location of the victims, then to follow up with subsequent data collection after six months. The few cases which cannot be completed at that time might be re-interviewed still later.

A full-scale study should also include data on the AIS-4 and -5 level injuries. These data will be difficult to obtain, both due to the rarity of the occurrence and due to reticence of individuals involved to provide them. However, if the costs of such injuries are as large as some of the previous estimates imply them to be, this would have crucial planning implications. A full-scale study might also address the question of estimating the costs associated with a fatality. One other category of possible interest would be the AIS 0 category – those persons who were uninjured. Presumably they would have no medical costs, except perhaps an occasional examination, but they would incur property damage costs and some inconvenience or lost time.

As mentioned previously, Washtenaw County is not typical of the nation. To be most useful, a national sample of injuries resulting from automobile accidents would be required. This could be coupled with a national sample of accidents, which would result in a distribution of the injuries by severities. Together, the cost by injury severity and the distribution of severities could provide solid information to base benefit-cost analyses upon. The total sample size necessary for the interviews would depend upon the precision desired and the detail desired in the data. For example, if separate cost estimates were desired for various geographical regions or for each state, this would increase the sample size considerably. If only a national figure is desired, then a total sample of 5,000 to 6,000 interviews would probably be sufficient. This would have to be supported with a national sample of accidents, to determine the distribution of injuries, and that would require the sampling and investigation of a much larger number of accidents.

CONCLUSIONS

The results of this study indicate that there is a wide difference in costs to accident victims with injuries in different AIS severities. In the lower severity categories, the costs are quite skewed and show a considerable variation. Most are associated with the property damage in the accident; the ambulance and examination in the emergency room are the only medical costs for the majority of the AIS-1 injuries. However, occasionally a person with an AIS-1 injury does have substantial medical costs.

As the severity increases, the major portion of the cost of the accident shifts from the property damage to the medical costs and the lost wages. For injuries in the AIS-3 category, medical costs and lost wages are roughly equal, with the property damage still a significant cost associated with the injury.

With a one- to two-year time lag between the accident and the follow-up interview, considerable difficulty was encountered in locating victims. It is suggested that in subsequent studies, the initial collection of data concerning costs be instituted as soon as possible, with subsequent re-interviews to ascertain the final totals. The most useful information is obtained from a personal interview. Telephone interviews are nearly as useful, but in the present study they were often not possible because an unexpected proportion of accident victims either had no telephone or had an unlisted telephone number. Mail responses were difficult to obtain and resulted in the poorest information – in part because the sampling instrument had not been revised to make it fully intelligible for the respondents.

A considerable proportion of non-responses was encountered, due primarily to inability to locate persons in the sample. Once located, accident victims were quite cooperative; only one refused to respond to only one of the questions.

The results of this survey are limited by the geographical area, the non-response rate, and the small sample sizes. The estimated costs per injury were substantially below those estimated by other sources. The estimate used by NHTSA corresponds reasonably well with the cost estimated here for AIS-3 severity. Injuries of this severity constitute only about 3% or less of all non-fatal injuries, and injuries more severe than AIS-3 constitute less than an additional 1%.

Personal interviews of accident victims appears to be a potentially useful method of obtaining data on costs of injuries resulting from motor vehicle accidents. However, the sampling costs of a national survey will be high, and must be coupled with solid information about the distribution of injury severities. A full-scale study should concentrate on obtaining data by interview – preferably in person, otherwise by telephone. Mail responses should be a last resort, possibly restricted to attempts to quantify biases caused by refusals or non-responses.

APPENDIX B
SOCIETAL COSTS - 1975 SUMMARY

Extract from: "Societal Costs of Motor Vehicle
Accidents - 1975"
DOT-HS-802 119, December, 1976

By: Barbara Mayer Faigin
Office of Program Analysis
National Highway Traffic Safety Administration

Societal Costs of Motor Vehicle Accidents - 1975

Summary Discussion

Motor vehicle accidents result in significant costs to individuals and to society at large. This report, which is an update and revision of a societal cost study published in 1972,¹ presents estimates of societal costs through quantification of societal loss components.

The purpose of this study is to assess some basic losses to society from motor vehicle accidents. Measurable cost components are identified to provide some indication of the scope of the human problem. However, the total of individual cost estimates of accidents should not be interpreted as the value placed on a life or as the total cost of a fatality or injury to society. Neither is it the total amount that society is willing to spend to save a life or to prevent an injury. Rather, the cost components and the total of these components are indicators of the significance of the motor vehicle accident problem.

The basic concept of societal loss is a decrease in individual and group welfare. Societal welfare is, in general terms, the sum total of individual well-being; and, in specific terms, it includes levels of health, production of goods and services (both qualitative and quantitative), personal satisfaction and happiness, and physical comfort. The concept goes beyond economic welfare. Precise specification of societal welfare would require determination of a consistent ordering of individual values and probably will never be specified in totality. In addition, quantification is not possible on all factors. The broad concept of societal welfare just described is embraced in this study with the recognition that all factors cannot be identified or measured.

Summary of Costs

Application of the societal cost components and totals should be considered with this conceptual basis in mind. The primary usefulness of the cost estimates is to serve as an indication of the magnitude of the problem. Though the societal cost estimates can be

useful in a benefit-cost context, it should be recognized that a benefit-cost ratio or net benefit figure is only one component of a relatively substantial array of social and technological factors that must be considered in evaluating the worth of a program.

The general approach of this study is to derive cost estimates that adequately reflect certain losses to society. Some losses are to individuals as a part of society and others are to society external to the individual. The two basic criteria for identifying loss components are (1) resources consumed in the repair of damage to people and vehicles that could be shifted in the long run to welfare-producing activities and (2) the consumption losses of individuals and society at large caused by losses in production and the ability to produce.

Costs of medical care, repair costs of vehicle damage, legal and court costs, accident investigation costs, and insurance administration costs relate to the first concept of loss. The resources consumed in these activities could be shifted to raise the existing level of economic and social welfare of society were they not devoted to "cleaning up" the damage from accidents. On the other hand, losses in production relate to the accident victim's inability to produce in the market context, in home and family activities, and in community service. Losses in production are also related to the time spent by others in response to accident ramifications and in the delay caused by the accident to others on the road.

The current measurement does not identify the redistributions that occur between individuals as a result of an accident; nor does the quantification determine how much of a loss is compensated and by whom the compensation is provided, whether by the individual, by private insurance, or by government. Redistributions in the Gross National Product (GNP) occur as the result of accidents; in fact, the overall level of GNP may be increased by the occurrence of accidents. Therefore, in the context of losses in societal welfare, a GNP approach to measurement is neither valid nor relevant. Losses may be largely to the individual for some cost components, but these are losses to society as a whole because the individual is an integral part of society.

¹ *Societal Costs of Motor Vehicle Accidents: Preliminary Report*, Washington, DC, National Highway Traffic Safety Administration, Apr. 1972.

Costs are presented in section II by fatality, by injury (by severity levels), and by property-damage-only involvement (i.e., per vehicle). Injury costs are estimated for the Abbreviated Injury Scale severity classification system, which is discussed in section III. The societal cost components are presented and discussed individually in section IV of this report. The conceptual basis, the data, and the method of calculation for each component are described. The study represents a slightly improved cost data base than existed in 1971,² but much improvement is still needed. As improved data become available, specific component cost estimates

can be adjusted. Appendix D discusses future directions in accident cost research.

Most costs were estimated for 1973, since these were the latest data for most sources at the time of analysis. These costs were updated to 1975 using a range of pertinent cost adjustment factors. These factors are presented in Appendix C.

Tables 1 and 2 present the average costs per fatality and injury by Abbreviated Injury Scale (AIS) level (see sec. III), and per vehicle for property-damage only (PDO) accidents.

² *Ibid.*

Table 1. Societal Costs, Summary, 1975 (Dollars)

Cost Component	Injury Severity (AIS)						
	6	5	4	3	2	1	PDO
Production/consumption:							
Market	211,820*	126,650*	55,550*	1,645	865	65	—
Home, family and community	63,545*	37,995*	16,660*	425	310	20	—
Medical:							
Hospital	275	5,750	2,250	1,095	450	45	—
Physician and other	160	5,520	2,160	525	165	55	—
Coroner-medical examiner	130	—	—	—	—	—	—
Rehabilitation	—	6,075	3,040	—	—	—	—
Funeral	925*	—	—	—	—	—	—
Legal and court	2,190	1,645	1,090	770	150	140	7
Insurance administration	295	295	285	240	220	52	30
Accident investigation	80	80	70	45	35	28	6
Losses to others	3,685	4,180	1,830	260	130	32	—
Vehicle damage	3,990	3,990	3,960	2,920	1,865	1,595	315
Traffic delay	80	60	60	160	160	160	160
Total	287,175	192,240	86,955	8,085	4,350	2,190	520

*7 percent discount rate.

Table 2. Average and Total Costs, 1975

	Fatality	Non-Fatal Injury					Average Injury	PDO Involvement
		5	4	3	2	1		
Average cost excluding vehicle damage and traffic delay, in dollars	283,105	188,190	82,935	5,005	2,325	435	1,360	45
Total	287,175	192,240	86,955	8,085	4,350	2,190	3,185	520
Number of occurrences in thousands	46.8	4	20	80	492	3,400	4,000	21,900
Total cost in billions of dollars	13.44	.77	1.74	.65	2.14	7.45	12.75	11.40

APPENDIX C
Interview Guide
and
Sample Letters

Washtenaw OAS Questionnaire
Occupant Interview Guide

The occupant should not be contacted until the interviewer has reviewed the available accident data (police report, injury report). Upon contacting a party, the interviewer will introduce themselves and indicate the circumstances of the call (or letter).

1. "Hello (good morning, good afternoon). My name is _____.
I'm from the Highway Safety Research Institute of The University of Michigan.
2. We are collecting information on the consequences of automobile accidents in an effort to increase safety on our highways. In order to accomplish this goal we need your help. While you are not required to respond, your cooperation is needed to make the results of this study comprehensive, accurate, and timely.
3. Any information you provide will be used for highway safety purposes. We're not interested in who was at fault in the accident. The University will keep all information strictly confidential. Such information will not be disclosed unless the Institute is required to do so by court order. Let me assure you that no personal identification will be entered into a data bank and that only summary statistics (without personal identification) will be reported.
4. It is the sincere desire of The University of obtain the best data possible. In the interest of safety we are asking for your cooperation in discussing (interviewer briefly identifies accident)." If subject consents, an interview appointment is established.

HIGHWAY SAFETY RESEARCH INSTITUTE

Institute of Science and Technology

Huron Parkway and Baxter Road
Ann Arbor, Michigan 48109

THE UNIVERSITY OF MICHIGAN

March 16, 1977

Mr. John Smith
123 Center Street
Anywhere, Michigan 48103

Dear Mr. Smith:

I appreciate your voluntary cooperation in our study of financial aspects of serious automobile accidents. Before our interview on Wednesday, it would be helpful if you could gather as much information as possible about your accident. Most of the information I need relates to the costs of:

- a. automobile and property damage
- b. hospitalization and out-patient care
- c. any accident-related medical expenses
(drugs, crutches, visits to therapists,
etc.)
- d. ambulance transportation
- e. any other expense incurred as a result
of your accident

If I can answer any questions, please call me at 763-3582. Thanks again for your participation; I will see you at 10:00 a.m. March 23.

Sincerely,

Susan Kornfield
Systems Analysis

SK/vld

HIGHWAY SAFETY RESEARCH INSTITUTE

Institute of Science and Technology

Huron Parkway and Baxter Road

Ann Arbor, Michigan 48109

THE UNIVERSITY OF MICHIGAN

March 16, 1977

Mr. John Smith
123 Center Street
Anywhere, Michigan 48103

Dear Mr. Smith:

The Highway Safety Research Institute at the University of Michigan is collecting information on the consequences of serious automobile accidents in an effort to increase safety on our highways. The information you disclose is strictly confidential and will not be revealed unless the Institute is required to do so under court order. Let me assure you that no personal identification will be entered into the data bank and that only summary statistics will be reported.

The goal of this study (Financial Consequences of Serious Automobile Accidents) is to gain knowledge about the cost of an accident to an individual and to society. This information will be used for many purposes, including cost-benefit analysis of safety features for cars, highway design, and a more realistic appraisal of the changes that occur to an individual's life as a result of an accident.

Your voluntary participation is greatly appreciated; without such cooperation a study such as this cannot be done. If you are interested in knowing more about the research being done at Highway Safety, you are most welcome to visit. Thank you very much for your time and effort.

Sincerely,

Susan Kornfield
Systems Analysis; Accident Research

Joseph C. Marsh
Co-investigator

Richard J. Kaplan, Ph.D.
Co-investigator

SK/JCM/RJK/vld

HIGHWAY SAFETY RESEARCH INSTITUTE

Institute of Science and Technology

Huron Parkway and Baxter Road

Ann Arbor, Michigan 48109

THE UNIVERSITY OF MICHIGAN

March 16, 1977

Mr. John Smith
123 Center Street
Anywhere, Michigan 48103

Dear Mr. Smith:

The Highway Safety Research Institute at The University of Michigan is conducting a study of individuals involved in automobile accidents. The purpose of the study is to collect information about the consequences of severe injuries. Gaining a more realistic appraisal of the changes that occur to individuals and their families as a result of an accident will aid in the analysis of vehicle and highway safety features.

At the time of your accident, HSRI did an investigation of the environmental and injury causation factors. Susan Kornfield of our staff is conducting interviews to follow-up on the consequences to an individual and society after the accident. No personal identification is entered into the data files, and only summary statistics will be published.

We can appreciate that this subject must be unpleasant for you to think about, and understand the difficulties involved in recalling facts and figures from an event that occurred many years ago. However, you are the only person who can supply us with the information we need, and your participation is of great significance.

We would appreciate being able to talk with you and further explain the project. Please call Susan Kornfield, collect, at (313) 763-3582, or fill out the enclosed card and we will contact you. Thank you for giving some thought to assisting our research.

Sincerely,

Joseph C. Marsh IV
Co-investigator

Ricahrd J. Kaplan, Ph.D.
Co-investigator
(313) 764-0248

JCM/RJK/vld

APPENDIX D
FINANCIAL CONSEQUENCES OF SERIOUS INJURY
DATA COLLECTION INSTRUMENT

1977 WASHTENAW OASIS QUESTIONNAIRE

Date: / /

Interview ID: _____

I. Accident Description

1. When was your accident?
 - a. approximate date _____
 - b. approximate time (e.g., afternoon) _____
2. How many vehicles (cars, trucks) were involved? _____
3. What type of collision did you have? _____
(Configuration of 1st harmful event) _____
(e.g., head-on, broadside, rear-end, hit object, off-roadway)
4. [CK 1st] Was your vehicle towed? Y N
5. [CK 1st] Was anyone in your vehicle transported for medical treatment
(e.g., hospital)? Y N
6. Please verify your age (birthdate) _____ Sex: M F
7. As a result of the accident did you go to a hospital? Y N
 - a. ER Room? Y N and/or b. Hospitalized? Y N
8. [If hospitalized] For how long were you in the hospital? _____

NOTES (comments):

II. Injuries/Consequences

<u>Body Region</u>	<u>Injury</u>	<u>Impairment</u>	<u>Disfigurement</u>
9. Head, Face			
10. Chest			
11. Abdomen, Pelvis			
12. Back			
13. Extremities			
Arms (Hands)			
(dominance)			
Legs (Feet)			
	fracture	function loss	permanent
	dislocation, sprain	part loss	temporary
	laceration, cut	amputation	cosmetic
	contusion, abrasion	permanent	
	internal trauma	temporary	
	hemorrhage, pain	paralysis	
	concussion	total	
		partial	
	severity		

III. Treatment

14. Did you receive any medical treatment other than hospital? Y N
- a. Outpatient/Clinic Y N _____(Number of visits)
 - b. Private Physician Y N _____
 - c. Self Treatment/ Y N _____
First Aid Y N _____
 - d. Physical Therapy Y N _____
 - e. Other Y N _____
-

15. Did you use an ambulance? Y N
[If yes] What was the cost? _____

16. Estimate your total medical expenses, regardless of who paid them.
_____ ()yr

OR: over \$500 (Y N) \$1500 (Y N) \$5000 (Y N)
\$15,000 (Y N) \$50,000 (Y N) \$150,000 (Y N)

17. Please estimate your specific medical expenses:

a. Approximate cost of hospitalization _____()yr
(Room) _____ (Treatment) _____()yr
(Diagnosis/tests) _____()yr

b. Estimate the cost of drugs _____()yr

c. Estimate the physicians' bill _____()yr

d. Estimate expenses for appliances
(crutches, wheelchair) _____()yr

e. Other medical costs (specify type and amount, e.g., dentist)

_____ ()yr

_____ ()yr

_____ ()yr

18. For Fatalities, please estimate funeral expenses: _____
_____ ()yr

Service _____

Transportation to home area _____

IV. Activity Restrictions

19. Did you miss any days on your job or from school? Y N [If No, to Q27]

20. [If any] How many "work" days did you miss? Total _____

Employment _____ School _____

Housekeeping _____ Weekends _____

21. Estimate the total wages lost due to the accident (even if reimbursed, e.g., vacation)

_____ ()yr _____ ()yr

22. How many days of each type of activity restriction [If none, to Q27]

Bed Rest _____ Tiredness/Soreness _____

Wheel Chair _____ Cosmetic _____

Crutches _____ Psychological _____

Cast on 1 Limb _____, More than 1 Limb _____

Other (specify) _____

23. How many days of activity restriction (all types) resulted from the accident?

24. Did you hire anyone to do things that you would have done yourself? (include child care, exclude your care) Y N [If No, to Q30]

a. What kinds of things? _____

b. What costs were incurred by hiring someone? _____

c. Was this cost paid by you? _____ \$/% Insurance? _____ \$/%

25. Did someone else (not hired) do things you would have done yourself?

Y N Details: _____

26. How much time did you spend in claims settlement? (days) _____,

Vehicle repair _____, court attendance _____,

Other _____.

27. [If any] How long was your convalescence? Total _____
 Days in hospital _____ Nursing Home _____
 Private Home _____ Own Home _____
28. When you were able to work did you feel your performance or efficiency was affected?
 Y N If so, for how long? _____
29. If not full efficiency, estimate the percent you did reach _____
30. When you did return to work, were your duties/occupation changed to accommodate your physical condition?
 Y N If yes, specify _____

31. Did this mean a reduction in your income? Y N \$ _____

V. Loss Recovery/Damages

32. Indicate approximate percentage (or dollars) of medical costs paid by the following sources:
- | | |
|---|---------------------------------|
| a. Yourself _____ | b. Health Insurance Co. _____ |
| c. Workman's Comp. _____ | d. Your Own Car Insurance _____ |
| e. Other Party-Insurance _____ | f. Other Party-Uninsured _____ |
| g. Other source (specify source and \$) _____ | |
33. What percent (or dollars) of lost wages were covered by:
- | | |
|---|---------------------------------|
| a. Yourself _____ | b. Vacation/sick leave _____ |
| c. Workman's Comp. _____ | d. Your own car insurance _____ |
| e. Other Party Insurance _____ | f. Other Party-Uninsured _____ |
| g. Private Income Protection Ins. _____ | |
| h. Welfare Compensation _____ | |
| i. Other source (specify source and \$) _____ | |
34. Estimate cost of damage done to your vehicle \$ _____ Repaired Y N
- | | | |
|---------------------------------|----------------------|------------------------|
| a. Costs: repair _____ \$/%, | towing _____ \$/%, | storage _____ \$/% |
| b. Paid by: Yourself _____ \$/% | Insurance _____ \$/% | Other Party _____ \$/% |

35. Estimate personal & vehicle contents damage costs. Total _____

a. Clothing _____ \$/% Cargo _____ \$/% Other _____ \$/%

b. Paid by: Yourself _____ \$/% Insurance _____ \$/%

Other Party _____ \$/%

36. Estimate other property damage [Objects and Costs]

a. _____, _____, _____

_____, _____, _____

b. Paid by: Yourself _____ \$/% Insurance _____ \$/%

Other Party _____ \$/%

37. Did you have to institute legal action to recover costs? Y N

a. Medical Y N b. Property damage Y N

c. Lost Wages Y N d. Pain & Suffering Y N

e. Other Y N _____

38. If you needed to institute suit, was it:

a. Settled out of court Y N b. By judge Y N

b. By jury trail Y N c. Not settled yet Y N

39. Estimate legal fees _____ Court costs _____

Bail Bond _____

40. If there was a legal settlement, court or otherwise:

a. What was the size of the settlement? _____

b. What percent (or dollars) did you actually receive? _____

41. What was the time (months) to settlement or recovery of costs by:

a. Insurance _____ b. Other Party _____

c. Legal Action _____

42. What other costs did you have (citations, insurance rates)? _____

43. Open Question: Were you treated fairly by police, lawyers, medical personnel, insurance companies, etc.? Any complaints? Inconveniences? Comments on the Questionnaire?

APPENDIX E
Human Subjects Committee Approval

Approved without modification

THE UNIVERSITY OF MICHIGAN
Ann Arbor

March 3, 1977

Re: Financial Consequences of Serious Injury

The Committee to Review Grants for Clinical Research and Investigation Involving Human Beings of the University of Michigan Medical Center has met and considered the application "Financial Consequences of Serious Injury".

The Committee is composed of fourteen members. Four members of associate professorial to professorial rank represent the Department of Internal Medicine. Two members of professorial rank represent the Department of Surgery. Two members of professorial rank represent the Departments of Anesthesiology and Otorhinolaryngology. Three members of associate professorial rank represent the Departments of Pediatrics, Psychiatry and Obstetrics and Gynecology. The Reverend Daniel Burke and Dr. Carl Cohen, Professor of Philosophy, serve as representatives of a non-health-related discipline. The Reverend Gordon Jones serves as the non-University affiliated member.

Upon review of the application "Financial Consequences of Serious Injury", submitted on behalf of J. C. Marsh, IV, the Committee has determined independently that the rights and welfare of the individuals involved in this research are carefully guarded. The methods used to obtain informed consent are appropriate. The risks to the individuals involved are felt to be minor, and the potential medical benefits of this investigation are of importance. Each investigator is required to inform this Committee of any change in research protocol or any adverse reactions occurring during the performance of this investigation. The investigator agrees to resubmit an application for continued approval of this investigation at intervals no greater than one year from the date of initiation of this research.

