

The University of Adelaide

Road Accident Research Unit

THE COST OF ROAD ACCIDENTS

by

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and

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FOREWORD

The Cost of Road Accident Study was conducted during 1980 by the Road Accident Research Unit of The University of Adelaide. The research was sponsored by the South Australian Department of Transport and was completed in June 1981.

The study is based on the accidents investigated in the Adelaide In-Depth Accident Study, also conducted by the Road Accident Research Unit, during the 12 month period from March 1976 (McLean and Robertson, 1979). In that time a representative sample of accidents to which an ambulance was called in the Adelaide Metropolitan Area was investigated by two teams each comprising a medical officer, an engineer and a psychologist. Observations at the accident scene began an average of eleven minutes after the ambulance was called and information from the scene was supplemented by further interviews with active participants (drivers, pedestrians, motorcyclists and cyclists), detailed examination of the accident sites and observation of traffic behaviour at the same time of day as the accident. The injured persons were examined and interviewed in hospitals and inspections of the vehicles were conducted in towing service depots and elsewhere.

The information derived from the 304 accidents in the original study has provided the fundamental data for The Cost of Accident Study. The four year period between the occurrence of the accidents and the current study was necessary in order to collect all the costs related to the accidents. On-going medical expenses, the legal and administrative costs associated with unsettled insurance claims, and estimates of long-term income loss must all be included as costs associated with the accidents. Even four years after the accidents the total cost estimates are biased downward because the final amount of court awards have not been settled for many severe injury cases and consequently information is not always available for the most seriously injured victims.

The aims of this study are to identify and quantify where possible the full range of costs associated with the case-study accidents. Rather than give gross averages of total costs for injury or property damage accidents as is often done

in published cost of accident reports, this study aims to give a break-down of losses and costs such as ambulance services, hospital and medical services, home care costs, property damage, legal costs, police investigation, towing costs and insurance administration. Foregone income estimates are derived for road accident fatalities and for casualties with differing degrees of permanent impairment. These estimates of foregone income, the losses to family and community and the estimates of the dollar value of pain and suffering comprise the greatest percentage of the total costs.

Such costs related to injury severities are particularly useful in cost-benefit analyses on proposed road safety programs. New road safety features are often able to reduce the degree of injury but not to eliminate injury (or accidents) and the cost estimates for each category of injury severity can be used with information on the changing distribution of injury severity to indicate the worth of the new safety feature. The detailed cost information is also of greater use to those planning future medical services or insurance schemes.

The distinction between private costs and true social costs (i.e. full costs to the community which include those costs that are not valued in the market) has been made in order to allocate the full financial losses between the individuals or organisations that incurred them.

The information on costs is related to our understanding from the In-Depth Study of the cause of the accident, and an estimate of the proportion of the total cost of the accident that can be attributed to each of the various causal factors has been given.

The results of this study are based on the Adelaide In-Depth case-study sample and although this sample has been chosen to be representative of the population of serious accidents in metropolitan Adelaide there are limits on the direct applicability of the results to South Australia or Australia as a whole. However, the magnitude and significance of the road accident problem is highlighted and the results give insight into many cost patterns and cost relationships that are likely to hold throughout Australia.

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associated with road accidents and the Australian Bureau of Transport Economics has assisted with the preparation of the 'Cost of Accident' questionnaire.

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1. INTRODUCTION

The total costs associated with road accident injuries, fatalities, vehicle damage and other property damage constitute the vital components in the calculation of the true social costs of road accidents.

The costs of serious road accidents in the State of South Australia during March 1976 to March 1977 are estimated to be \$395 million (\$A 1980). The significance of such costs often induces questioning as to why expenditure on road safety is not increased to the level required to minimize accidents, injury and death.

Alternatively, the costs of road accidents are seen as the sacrifice required to enjoy the advantages of motoring. The total costs involved in eliminating accidents would far exceed the benefits to be achieved in such a drastic step, elimination of accidents would require the abolition of road traffic and this in turn would result in severe financial, economic and social costs to the community.

Consequently, it appears that there is in fact a DEMAND for some accidents, some accident injuries and some fatalities and there is also an implicit value on life beyond which costs will not be incurred to reduce the loss of life.

The objective of this research is to estimate the total costs and full losses caused by traffic accidents. The need for quantitative analysis cannot be denied in a situation where road accidents are responsible for the loss of more lives below the age of 50 than any other cause. Road accidents are the largest killer of children aged less than 20 years in South Australia and the third largest killer for adults, after heart disease (ischaemic heart disease and cerebrovascular disease) and malignant neoplasms.¹

The degree of confidence we can have in the final estimates of the 'cost of road accidents' must be qualified by some of the difficulties involved in trying to measure the costs. The objective costs such as hospital charges and vehicle damage are relatively easy to determine as they usually have market values. However the price in the market is often not a true reflection of the social costs (e.g. Government subsidies enable hospitals to charge patients less than the true cost of the service rendered) and more importantly the unmarketed or subjective costs are very difficult to rank in dollar terms, e.g. the costs of pain and suffering.

The costs estimated in this study indicate that serious road accidents in the Adelaide Inner Metropolitan Area cause losses to the community in the order of \$188 million (\$A 1980) each year.

A description of the sampling procedure and method of investigation used in this study is contained in Section 2. This is followed by a discussion of the theoretical concepts of road accident cost analysis in Section 3. This section may be regarded as theoretical background information and as such it is not essential reading for those persons primarily interested in the empirical results. The major cost parameters are identified in Section 4 and the valuation procedures for each cost parameter are detailed in Section 6.

The total road accident costs for the Adelaide Inner Metropolitan Area and for South Australia are given in Section 5 and these costs are analysed in terms of accident type and major error of the road user in Section 7. The summary and recommendations are presented in Section 8. Appendix A contains a discussion of the respondent-completed questionnaire together with a discussion of the results derived from the questionnaire.

¹ Australian Bureau of Statistics : Deaths
1978 (3302.4)

2. SAMPLING PROCEDURE AND METHOD OF INVESTIGATION

2.1 DESIGN OF THE SAMPLING PROCEDURE - ADELAIDE IN-DEPTH STUDY

The cost of Accident Study was based on the accidents investigated in The Adelaide In-Depth Study. As it was impractical to conduct an in-depth investigation of all the serious accidents in the Adelaide Metropolitan Area a sampling scheme was developed.

The sample population was defined as all road accidents to which an ambulance was called in the central section of metropolitan Adelaide in the 12 month period between March 23, 1976 and March 22, 1977. A sampling procedure was developed to provide a sample representative of this population.

The sampling procedure resulted in a schedule of working periods. During each working period one of the two research teams was on call. These on-call periods were selected in such a way as to yield a sample that was representative of the population of accidents by time of day and day of week.

Accidents were not sampled during times when the accident rate was expected to be very low and consequently accidents were not, in general, sampled in the early morning periods.

The sampling scheme resulted in 304 accidents being investigated. This was eight per cent of the total of 3,820 ambulance-attended accidents during the 12 month period.

Usually it is preferable to work with a statistically random sample because it is then possible to make valid use of statistical theory to assess the degree of reliability of any estimates that may be based on the data from that sample. In the original study there were several practical limitations that prevented the use of random sampling techniques.

1. The research team could not be expected to be on call 24 hours a day for a full year, consequently there was a need to give the research personnel advance notice of their working hours.
2. When a team was on call it had to decide immediately whether an accident reported to the ambulance was eligible for inclusion in the study. The average time taken for a team to reach the scene of the crash after having been notified by the ambulance radio was about eleven minutes.

3. It took up to two hours to collect the necessary information at the scene of an accident and during this time it was quite possible that other accidents may have occurred. These other accidents, therefore, could not be sampled.
4. The accident rate varies by time of day, day of week and with weather conditions, among other factors. Some allowance was made for variation by time of day and day of week, but there is still chance variation in this respect, and any variations due to changes in weather conditions are almost impossible to predict.
5. With a research team comprising three professionally qualified members the standby cost was very high and therefore it was inefficient to go on call at times of low accident frequency.
6. Despite the willing co-operation of the St. John Ambulance Radio Controllers there were times when they forgot to notify the research team that a relevant accident had occurred.
7. Minor accidents, usually those at which the ambulance was not required, were sometimes cleared up before the research team arrived at the scene. (In such cases the team abandoned its attempt to investigate the accident.)
8. Because it took the research team longer to travel to accidents which occurred close to the boundaries of the study area, minor accidents, of the type mentioned in 7. above, were more likely to be missed in those localities than they were if they occurred close to the centre of the study area.
9. Objective selection criteria were essential if the researchers, however well motivated, were to avoid the natural tendency to bias their selection of accidents to be investigated towards those which are either interesting or convenient.

Chi-square tests do however show it is reasonable to assume that the sample of accidents has been drawn at random from the population of accidents. A random sample is not necessarily adequately representative, but apart from an excess of accidents sampled on Mondays (which is not expected to have a significant bias on any cost calculations) the aim of achieving a time distribution in the sample which was similar to that in the population was satisfied.

The research teams generally did not work on public holidays as it was considered that the sample of accidents on public holidays would be too small for any inferences to be made about differences between the types of accidents which may occur on public holidays and those which may occur on other days. However, it is worth considering that the costs of damage to vehicles in accidents on public holidays may be lower than the costs of week-day accidents because the lower number of commercial vehicles on the road results in damage to a relatively less valuable population of vehicles. The financial (or transaction) costs of road accidents on public holidays are likely to be greater than the costs on week days because loadings on wages must be paid to those working through the holiday, e.g. for medical services, ambulance officers, police and tow-truck operators. This does not alter the true social cost of the public holiday accidents because the same human and physical resources are used in each case and these accidents are expected to have similar cost patterns to accidents that occur on Sundays.

In a random sample of 304 accidents 6.4 accidents on public holidays would be expected to be included. In this study only two accidents on public holidays were included but this is not expected to result in any significant bias to the estimates of cost.

The sampling procedure included fewer wet weather accidents than would be expected for a random sample. This was the result of the necessary limit put on the number of accidents which could be investigated in any shift. This limitation caused the increase in the rate of accident investigation during wet weather to be less than the increase in the accident rate. Data from the Commonwealth Bureau of Meteorology on hourly rainfall for central Adelaide during the study period indicates an increase of 35 per cent in accident frequency in wet weather. The proportion of wet weather accidents in the sample (3.9 per cent) is lower than that in those accidents which were not included in the sample (6.5 per cent) but this difference is not statistically significant and consequently any bias in the cost estimates resulting from an underestimate of relatively severe accidents in wet weather does not significantly alter the results or conclusions.

2.2 METHOD OF INVESTIGATION - ADELAIDE IN-DEPTH STUDY

The accident investigation was carried out by one of two teams, each consisting of a medical officer, an engineer and a psychologist. While on duty each team continuously monitored the St. John Ambulance radio, and usually heard the radio controller despatch an ambulance to an

accident before the controller called the team specifically.

The investigation of each accident comprised two parts - first, at the scene of the accident and secondly follow-up investigations which consisted of interviews with the active participants in hospital or at home and also the examination of the damaged vehicles.

At the scene, the aim of the investigation was to determine what each driver thought had happened immediately prior to the accident and to observe their physical condition. The accident scene was examined for any factors that may have contributed to the cause of the accident or the resulting injuries and property damage. The engineer was particularly concerned with features of the vehicle which could change either with time or during the removal of the vehicle from the scene.

Photographs of the accident site and plans of the main roads and traffic control features were made in each case.

Follow-up investigations in hospital were made by the medical officer and where permission was given, the injuries of the participants were examined and photographed. Results of blood alcohol tests and information on the treatment the participant received was made available to the medical officer during the period of the participant's hospitalisation.

The follow-up interviews were usually done at home with the active participant (driver, rider or pedestrian) and were conducted by the psychologist. These interviews included a review of the person's recollection of the events leading up to the accident and his understanding of attitudes to various safety measures.

The engineer conducted a follow-up in-depth examination of each vehicle, usually in a towing service depot or crash repair shop. A detailed record was made of the specification and conditions of the equipment on the vehicle and of damage to the vehicle structure resulting from the accident.

The information collected was recorded on data sheets in one of three files : Medical, Psychological or Engineering. These files together with an average of 40 colour slides form the basic record of each accident and this information constitutes the background data on which the Cost of Accident Study has been based.

2.3 RETRIEVAL OF DATA FROM ADELAIDE IN-DEPTH STUDY FILES

Each accident was reviewed to extract information relating to the cost of the accident. All the participants who may have sustained some financial loss through injury or vehicle or property damage form the relevant population for this study and these people were identified. Their address at the time of the accident was recorded to help find their current whereabouts and the objective, where possible, was to mail a questionnaire to each person asking about the extent of the losses or costs involved with their accident.

The In-Depth Study files listed all those involved in the accidents. Information on the participant's name, reported address and often telephone number was given and this facilitated fast initial identification of the participants. This information is confidential and has been used solely for research purposes.

A search through the injury and vehicle damage information indicated those persons who were not expected to incur any financial loss as a result of the accident and they were eliminated from the study at this stage. This group primarily consists of uninjured passengers who did not require or seek medical attention nor had any responsibility for the damaged vehicle. In a few cases the uninjured driver of an undamaged car (involved in an accident with a pedestrian or pedal cycle) was not expected to incur any cost. In these cases it is obvious that the subjective costs of pain and suffering, of guilt and worry and their consequent effect on family life or work performance remain of significance. However, these costs have not been quantified and in this respect the 'cost of accident results' presented in Section 5 represent an underestimate of the true social costs.

2.4 TRACING OF PARTICIPANTS WHO SUFFERED LOSSES

Several methods were used to trace the participants. This process was a difficult one because of the length of time that had elapsed since the accidents. The most recent accident was investigated on 22nd March 1977 and the oldest was investigated one year earlier on 23rd March 1976. A surprisingly large proportion of accident victims had moved from their residence at the time of the accident without leaving a forwarding address. Many did not have a telephone and approximately 25 per cent of the sample could not be traced. A search through the Adelaide Telephone Directory (and relevant country directories) located those people who had telephones and who had remained in the Adelaide Metropolitan Area (or same country region). Three hundred and twenty people, or 42.0 per cent of those expected to incur costs were

found using this method.

The tracing of individuals was particularly difficult when the participants were children and the father's initials were not known; also women who had married (and changed their surnames) in the four year period proved difficult to find. These people and those with no telephone, unlisted telephone numbers or numbers listed under a different name had to be traced by other means.

For these cases the Commonwealth of Australia and State of South Australia Electoral Rolls were examined. The Electoral Rolls provide the name, address and occupation of all South Australians eligible to vote in State and/or Federal Elections. Thus, by relating the participant's address (at the time of the accident) to the appropriate electoral division and sub-division it was possible to see if the participant was still listed. This method proved successful for those persons who had not moved or changed their address since the accident or for those who had moved but still remained within the same electoral sub-division. One hundred and seventy-six people or 23.4 per cent of the participants were found using this method.

This method was not satisfactory in trying to find those persons who had moved but not changed their address on the Electoral Rolls or those who had moved from their original sub-division. The State Electoral Rolls were compiled in August 1979 and consequently some people had moved between the time the Rolls were updated and the time this search was undertaken in early June 1980.

After this procedure there were still 263 participants who had not been traced and in a final attempt to find them it was decided to search each electoral division in the South Australian Electoral Rolls to cover every possibility of the whereabouts of these people. This long process, undertaken by Bureau of Transport Economics staff in Canberra resulted in another 76 current addresses.

A total of 574 people or 75.4 per cent of all those expected to incur financial loss were located. However, from the telephone calls made before sending the questionnaire it was found that 12 persons were no longer alive, ten persons were living interstate or overseas and 59 persons were unwilling to co-operate with the study. The remaining 493 participants were sent a reply-paid mail questionnaire that related specifically to the type of costs they were expected to have incurred as a result of the accident.

The concepts of road accident cost analysis that are discussed in the following section provide theoretical background information to this study. As such, Section 3 is not essential reading for those persons primarily interested in the practical aspects and the results of this study.

3. CONCEPTS OF ROAD ACCIDENT COST ANALYSIS

3.1 COST-BENEFIT ANALYSIS AND SOCIAL WELFARE

The idea that road accidents (and their associated costs) may simply be an inevitable consequence of society's demand for road use and motor transport has been introduced earlier in this study, and it is true that the funds required to minimise road accidents through traffic safety programs are not readily attainable. Road safety proposals must compete for finance with other economic and social programs and so the essential problem of economics - the need to economise with scarce resources - is confronted.

It is hoped that this cost of accident study will provide a valuable input into decisions concerning the optimal allocation of financial resources to road safety. However, the evaluation of safety programs should not rely solely on accident cost estimates and it is important to clarify the fundamental objections to such a reliance.

Isolated cost analyses do not measure the worth of road safety programs nor the benefits that accrue from a reduction in the risk of accidents. Correspondingly it is misleading to use the changes in cost levels as an indication of the benefits from safety proposals.

The theoretical requirements for the satisfactory evaluation of social benefits require consistency with the basic rationale of all cost-benefit calculations. Mishan (1971) summarises this notion ...

"... if we are concerned, as we are in all allocative problems, with increasing society's satisfaction in some sense, and if, in addition, we eschew interpersonal comparisons of satisfactions, we can always be guided in the ranking of alternative economic arrangements by the notion of a Paretian improvement - an improvement such that at least one person is made better off and nobody is made worse off ..."

This criterion of social gain is the fundamental rationale of all cost-benefit analysis and to relate this rationale to road safety a specific situation is considered.

The decision is made to upgrade a four mile stretch of highway which has a high fatality rate. The new highway will incorporate several additional safety features. This investment will undoubtedly save some lives and yet it will also cause inconvenience to those

residing near the highway, with additional traffic and greater noise and pollution levels.

The increase in welfare to those who gain from the road can be measured by a COMPENSATING VARIATION (C.V.), that is a measure of "willingness to pay" - equal to the amount an individual who has gained will pay rather than forego the benefit of the road (i.e. a positive C.V.). Compensating variations also measure the decline in welfare of those who are made worse off as a result of the road, their C.V. measures the amount an individual will accept to endure the new road (i.e. a negative C.V.).

Consistency with the idea of a Pareto improvement would result in the road being built if the sum of the positive C.V.s was greater than the sum of the negative C.V.s, i.e.

$$\sum_{i=1}^n C.V._i > 0$$

The evaluation of life or the evaluation of any decrease (or increase) in injury severity should theoretically be made with reference to C.V.s, i.e. the sum an individual is willing to pay (accept) in exchange for life or a lower (higher) level of injury severity.

The monetary value of post-accident costs that are estimated in this study do not provide an exact measure of the social value of eliminating these accidents. The cost figures do not measure the total benefits that would accrue to society with improvements in road safety or from the reduction in the risk of accidents. The cost estimates that are derived do not indicate the social value placed on life, they do not indicate the total social value placed on accident injuries or fatalities but rather they provide estimates of the significance of the road accident problem and as such they are useful in intra-Australia and international accident cost comparisons. They allow the ranking of the problem with other economic and social problems that compete for financial attention, and the identification of cost parameters is a fundamental input to policy decisions.

Any attempt to undertake a full appraisal of road accidents would involve extensive personal interviews to obtain subjective valuations for reductions in risk of death or injury. In this seventeen month study finance was not available to do this. I recommend it as

an area for future study.

It is assumed that the resources absorbed in restorative action and the foregone services resulting from the accidents would be used to increase social welfare and improve efficiency in other areas had the accident not occurred. This assumption of the full employment of resources obviously does not transgress reality to any great extent.

Many of the post accident consequences to be valued do not have explicitly observed market costs. Because of this a considerable part of economics and certainly parts of this study rely on the concept of opportunity cost. It is used to determine the relevant cost of some of the consequences of accidents by looking at the best alternative to the absorbed resource or foregone flow of services. It is the value foregone through not undertaking the most rewarding alternative activity, e.g. the additional care afforded the injured individual after hospital discharge is usually provided by family or friends who would otherwise be in alternative activities. The cost of additional care is measured in terms of the opportunity cost of the alternative activity, e.g. the income that could have been earned at work.

3.2 EX-ANTE AND EX-POST COST ANALYSIS

The following discussion in this Section considers the advantages and disadvantages of the two alternative approaches to the measurement of road accident costs. The two major approaches that may be followed are the EX-ANTE METHOD and the EX-POST METHOD.

In principle accident costs should be calculated using a method that is consistent with the Pareto principle¹ and with the aim of increasing the total welfare of the community. In this respect the ex-ante method is the most satisfactory.

Theoretically, any loss of life or increase in injury severity as a result of road accidents should be valued according to the Pareto principle. Consistency with this principle results in costs being evaluated by reference to what each member of society is willing to pay to reduce the risk of road accidents (or in the extreme case - to eliminate road accidents).

The ex-ante measure of accident costs is estimated by the amount of money society would be prepared to pay to achieve successive reductions in the potential costs of road accidents, it is based on the sum of the amounts that all persons involved would be willing to pay to reduce the cost of death and cost of injury severity.

This method is more suited for future policy analysis as it can formalise the relationships between the risk of accidents, the expected rate of accidents and the potential accident costs incurred. However, the conceptual problems and the near-impossibility for individuals to accurately value an almost imperceptible change in the risk of injury (when the total risk is already very small) render the method largely untried and it will not be used in this study, due to the practical difficulties involved in its application.

The ex-post method measures actual costs after the accident has occurred. The method was adopted for this study and it involved estimating the costs and loss benefits involved in restorative action for the representative sample of actual accidents.

The information from the Adelaide In-Depth Accident Study provided an excellent data base on which the ex-post method of costing could be conducted. The method was meaningful to those persons asked to estimate the total cost of their own road accident. The ex-post method was relatively simple and inexpensive to implement and it did not have the conceptual problems involved in the ex-ante method.

The ex-post method has been used to derive estimates for each of the fourteen major cost parameters that encompass the total societal losses resulting from road accidents.

The major component of loss was incurred by those individuals who were directly involved in the accidents: these were the direct costs. The other component of loss was incurred by the community and was external to the individual: these were indirect or external costs. The summation of all direct and external costs comprise the total social costs of the accidents in the sample and the aim of this study is to identify all the cost parameters and then value those that are measurable.

¹ The Pareto principle is relevant in choosing between various economic alternatives and, assuming comparisons can be made between interpersonal preferences, a Pareto improvement ensures that at least one person is made better off and nobody is made worse off and thus social gain is ensured.

4. IDENTIFICATION OF MAJOR COST PARAMETERS

The fourteen major cost parameters are identified under the headings of five primary ex-post consequences of accidents. These consequences are based on the categories put forward by Troy and Butlin (1971).

1. LOST PRODUCTIVE CAPACITY (of victims) and LOST PRODUCTIVE CONTRIBUTION (from those persons not directly involved in the accidents, family or friends of the victim - 'external participants')
2. ABSORPTION OF CURRENT RESOURCES AND SERVICES IN RESTORATIVE ACTION.
3. ADMINISTRATIVE COSTS.
4. FOREGONE SERVICES OF DAMAGED PROPERTY.
5. PAIN AND SUFFERING.

Table 1 summarises all the economic and social costs that are likely to be incurred with road accidents. The Table indicates which costs are valued in this study.

4.1 LOST PRODUCTIVE CAPACITY AND LOST PRODUCTIVE CONTRIBUTION

FOREGONE INCOME (a)

This parameter relates to fatalities and to those injured individuals who suffer any form of temporary or permanent disability that prevents them from working a 'normal' number of hours. It covers both past and future income losses by the injured person. For those persons involved in activities where there is no income or market valuation of their contribution (e.g. housewives, students or the unemployed) an income has been assigned to indicate the value of their activity. A direct cost.

FOREGONE INCOME (b)

This parameter measures the value of duties undertaken by family and friends in caring for the injured person. To avoid double counting of the cost it is incorporated under Parameter 5 where a more detailed explanation is given.

FAMILY AND COMMUNITY LOSSES

This parameter accounts for the loss of the injured individual's contribution to family and community activities. A direct cost.

4.2 ABSORPTION OF CURRENT RESOURCES AND SERVICES IN RESTORATIVE ACTION

This Section includes the cost parameters involved in undertaking restorative action and in satisfying the demands of accident victims. Resources and services are absorbed in these post-accident actions.

AMBULANCE COSTS

This parameter covers the cost of resources used in the transport of the injured person from the scene of the accident to hospital. A direct cost.

HOSPITAL AND MEDICAL TREATMENT

This cost parameter covers the cost of resources used in treating the injured person and is subdivided into several forms of treatment:-

- On-site treatment (from St. John Ambulance)
- Hospital in-patient costs
- Hospital out-patient costs
- Hospital paramedical costs (dentistry, physiotherapy, occupational therapy, social work and optical treatment.)
- Medical treatment outside hospital (doctors, dentists, physiotherapy, chiropractors, occupational therapy, psychiatry or any other treatment.)

All these are direct costs.

ADDITIONAL CARE

Additional care is defined to include any home care given after the individual is discharged from hospital and time spent transporting the injured person for additional medical attention. Usually these duties are undertaken by family or friends of the injured person, and the basic concept for cost measurement is the opportunity cost of the time spent by family or friends in these activities. This cost is consequently related to lost productive contribution (where an income or productive contribution is imputed for housewives or those still at school).

REPAIR OR REPLACEMENT OF DAMAGED PROPERTY

This parameter covers the cost of resources used in the repair or replacement of damaged property. This includes property related to the accident victim - motor vehicles, pedal cycles, goods carried and clothing (direct costs) and also road facilities, houses and fences (external costs).

TABLE 1: COST PARAMETERS, SUMMARY

LOST PRODUCTIVE CAPACITY AND LOST PRODUCTIVE CONTRIBUTION

1. Foregone Income - Victim
- Foregone Income - External (see Parameter 6)
2. Family and Community Losses

ABSORPTION OF CURRENT RESOURCES AND SERVICES IN RESTORATIVE ACTION

3. Ambulance Costs
4. Hospital and Medical Treatment:
 - On Site
 - Hospital Inpatient
 - Hospital Outpatient
 - Hospital Paramedical
 - Private Doctor treatment
 - 'Additional' Medical treatment
5. Additional Care
6. Repair or Replacement of Damaged Property:
 - Related to Accident Participant
 - Motor Vehicle
 - Goods carried - Not estimated
 - Clothing - Not estimated
 - External
 - Road Facilities
 - Houses and Fences
7. Legal and Court
8. Police Investigation
9. Towing
10. Funeral
11. Miscellaneous Restorative Action
 - Related to Accident Participant - Transport
 - External - Transport
 - Restaffing, retraining, etc. - Not estimated
 - Traffic congestion - time and fuel - Not estimated

ADMINISTRATIVE COSTS

12. Insurance Administration

FOREGONE SERVICES OF DAMAGED PROPERTY

13. Foregone Services from Damaged Property.
 - Related to Victim - Motor Vehicles - Not estimated
 - Goods carried - Not estimated
 - Clothing - Not estimated
 - External - Road Facilities - Not estimated
 - Houses and Fences - Not estimated

PAIN AND SUFFERING

14. Pain and Suffering
 - Related to Victim
 - External - Estimated for fatal cases

LEGAL AND COURT

This parameter covers the cost of resources used to provide legal and judicial services. A direct cost.

POLICE INVESTIGATION

The police attended 284 of the case study accidents. This parameter provides a measure of the cost of resources used in police investigation of accidents including traffic supervision, interviewing witnesses and reporting procedures.

TOWING

This parameter covers the cost of resources used to tow damaged vehicles from the scene of the accident. A direct cost.

FUNERAL

This parameter measures the difference between average funeral costs at the 'normal' time of death (calculated from Australian Life Tables) and the average funeral costs in 1976 - the year of death. A direct cost.

MISCELLANEOUS RESTORATIVE ACTIONS

This parameter covers the cost of resources used in transporting the injured person for medical treatment. Also the cost of transport to family and friends for visiting the injured person in hospital or nursing home or while recovering elsewhere. These are direct and indirect costs respectively.

Costs to employers through restaffing, retraining or re-organisation as a result of losing an employee are considered under this parameter. An external cost.

Traffic congestion costs at the scene of the accident are considered in terms of the cost of time and fuel resources consumed. An external cost.

4.3 ADMINISTRATIVE COSTS

INSURANCE ADMINISTRATION

This parameter covers the cost of resources used in administration of third party personal injury insurance cover and comprehensive insurance cover.

4.4 FOREGONE SERVICES OF DAMAGED PROPERTY

FOREGONE SERVICES FROM DAMAGED PROPERTY

The lost flow of services will be evident in all accidents with damaged physical assets such as motor vehicles, goods

carried or clothing (direct costs relating to the injured individual) and other property such as houses, fences, utility poles, fire hydrants and traffic signs (external costs).

A lost flow of services also results from the immediate delay to traffic flow at the scene of the accident. An external cost.

4.5 PAIN AND SUFFERING

PAIN AND SUFFERING

This is relevant to the injured person and also to the families of fatality cases.

4.6 INTRODUCTION TO INFORMATION SOURCES

There are effectively two primary sources of information that can be used to derive the full social and economic costs of road accidents. This study has made use of both sources:

- (a) indirect composition, and
- (b) direct contact with the road accident participant.

Indirect composition relies on various data sources to give objective dollar estimates of the cost components. In this study, this method has been used where direct contact with participants was unable to provide comprehensive or reliable results. Indirect cost information has been obtained from all the major public hospitals (to which the participants were transported), from police reports, from insurance companies (indicating third party claims and breakdowns of the final awards), funeral directors and the police force. The majority of 'cost of accident' studies use this method as direct information is more difficult and usually more costly to obtain.

In this study, the reasonably small sample of 304 accidents, involving 976 people has facilitated extensive use of direct information, through respondent-completed questionnaires. The questionnaires have facilitated the investigation of several new cost components. The effect on family and community life resulting from injury has been analysed in terms of past and future income losses as well as the social impact of the care required by the victim and the impact of reduced mobility.

Often the medical attention received outside a hospital is omitted in cost calculations, but with direct information the additional medical treatment received can be considered, as can the cost of transport for outpatient visits (or to private doctors, dentists or ancillary personnel) and the cost of transport for family and friends to visit those victims recovering in hospital.

The sources of information on each cost parameter will be discussed in greater detail in Section 6. Particular importance is placed on the questionnaire

development, its results and its potential to provide undocumented information. This source of information is examined fully in Appendix A.

5. RESULTS - ROAD ACCIDENT COST ANALYSIS

The social and economic costs of serious road accidents presented in this study should be recognised as minimum costs. Four of the cost components identified in this study have not been valued. The importance of these components - damaged goods and clothing, restaffing and re-training (done by employers as a result of losing employees through injury), traffic delays at the accident scene and the foregone services of damaged property - is by no means diminished and they remain intangible losses only because they are difficult to measure. Their omission must emphasise that the aggregate costs of serious road accidents given in this study are not exact figures but estimates that serve to indicate an order of magnitude of the road accident problem in Adelaide and South Australia.

5.1 ROAD ACCIDENT COSTS BY LEVEL OF INJURY SEVERITY

All the costs are derived from analysis of the 304 case-study accidents and Tables 2 and 3 present the tangible cost parameters as average cost estimates by level of injury severity.

Faigin (1976) first introduced this type of cost analysis by injury severity. It is a more satisfactory cost measure than simple averages as in each collision type costs are widely dispersed around the mean and are usually highly skewed towards low cost levels. Typically, there are relatively few accidents in which very high personal and property costs occur and a great number of accidents involving property damage only. This typical skew in cost distribution is not immediately obvious in this study because only serious road accidents, those to which an ambulance was called, have been considered.

INJURY SEVERITY SCORE

The Injury Severity Score (ISS) has been used to indicate a measure of overall injury severity. This measure is determined by rating each injury with the Abbreviated Injury Scale (AIS), then adding together the squares of the highest AIS rating for each of the three most severely injured body regions. (Concussion, with a period of unconsciousness of less than 15 minutes, has an AIS rating of two, and therefore a contribution to the overall ISS of four.)

RESULTS

The cost estimates in this study are based on 1976/1977 information but the costs in 1976 dollars have been updated to 1980 dollar costs using appropriate price indices for each cost parameter. These indices are shown in Appendix B.

The average cost to the community when a person was killed in a road accident in 1976 has been estimated at \$212,087. This cost is increased to \$307,158 in 1980 values. The fatality costs are significantly greater than even the critical injury cases (ISS = 15+) due to the high levels of foregone income that comprise the major portion of fatality costs. The importance of foregone income, its method of calculation and reliance on the choice of a discount rate are fully discussed in Section 6.1.

Some insight can be gained into the wide divergence in accident costs by looking at the costs allocated to those persons who were involved in the accidents but who were not injured (ISS = 0). These costs were \$485 (\$1976) and \$715 (\$1980). (Tables 2 and 3)

In 1976 the cost of an uninjured participant (\$485) represented 0.229 per cent of the costs for a fatality. In 1980 the comparable per cent was 0.233 and the divergence in the two percentage figures is explained by the use of different price indices (shown in Appendix B) to increase each 1976 dollar cost component to 1980 dollar costs.

5.2 TOTAL ROAD ACCIDENT COSTS

RESULTS FOR CASE-STUDY ACCIDENTS

On the basis of these average social costs by level of injury severity the costs for the total accident sample have been calculated. These costs are shown in Table 4. For the 304 serious road accidents the 1976 costs total \$10,449,464. When updated to 1980 values the costs total \$15,041,879.

RESULTS FOR THE ADELAIDE INNER METROPOLITAN AREA AND SOUTH AUSTRALIA

The case study accidents represent an eight per cent sample of all of the serious road accidents in the Adelaide Inner Metropolitan Area. This study area, which comprised

TABLE 2: AVERAGE COST OF ROAD ACCIDENTS BY LEVEL OF INJURY SEVERITY (\$A 1976)

Cost Parameter	Injury Severity Score (ISS ¹)						
	Fatal	15+	9-14	5-8	2-4	1	0
Foregone Productive Contribution	152,116	86,948	38,135	248	199	44	0
Family and Community Loss	53,241	30,432	13,347	87	42	15	0
Ambulance	41	41	32	26	18	6	0
On-site Treatment	0	0	0	0	2	4	0
Social Inpatient Treatment	195	6,135	2,074	469	275	49	0
Social Outpatient Treatment	0	235	165	40	34	23	0
Social Paramedical Treatment	0	120	120	25	9	1	0
Private Medical Treatment	0	7	20	47	30	11	1
Additional Medical Treatment	0	66	65	36	29	7	0
Additional Care	0	2,150	252	130	72	51	0
Motor Vehicles	159	960	500	540	630	385	405
External Damaged Property	10	20	20	10	10	10	10
Legal and Court	1,108	1,629	1,243	506	163	142	0
Police Investigation	875	292	257	224	165	69	35
Towing	5	10	10	10	10	5	5
Funeral	461	-	-	-	-	-	-
Miscellaneous	0	53	24	14	6	2	0
	0	55	41	30	16	0	0
Insurance Administration	349	409	349	349	349	289	39
Pain and Suffering	3,527	12,867	5,397	2,801	1,064	727	0
Average Cost Per Level of Injury Severity	212,087	142,429	62,051	5,592	3,123	1,840	485

Note: ¹ Refer Section 5.1 Injury Severity Score

TABLE 3: AVERAGE COST OF ROAD ACCIDENTS BY LEVEL OF INJURY SEVERITY (\$A 1980)

Cost Parameter	Injury Severity Score (ISS ¹)						
	Fatal	15+	9-14	5-8	2-4	1	0
Foregone Productive Contribution	220,340	125,944	55,239	359	288	64	0
Family and Community Loss	77,119	44,080	19,333	126	101	22	0
Ambulance	60	60	47	38	27	9	0
On-site Treatment	0	0	0	0	3	6	0
Social Inpatient Treatment	255	8,022	2,712	613	360	64	0
Social Outpatient Treatment	0	307	216	52	44	30	0
Social Paramedical Treatment	0	157	157	33	12	1	0
Private Medical Treatment	0	10	29	69	44	16	1
Additional Medical Treatment	0	97	96	53	43	10	0
Additional Care	0	3,169	371	192	106	75	0
Motor Vehicles	231	1,394	726	784	915	559	588
External Damaged Property	15	29	29	15	15	15	15
Legal and Court	1,545	2,272	1,734	706	227	198	0
Police Investigation	1,264	422	371	324	238	100	51
Towing	8	15	15	15	15	8	8
Funeral	686	-	-	-	-	-	-
Miscellaneous	0	81	37	21	9	3	0
	0	84	62	46	24	0	0
Insurance Administration	464	544	464	464	464	384	52
Pain and Suffering	5,171	18,866	7,177	4,107	1,560	1,065	0
Average Cost Per Level of Injury Severity	307,158	205,553	88,815	8,017	4,495	2,629	715

Note: ¹ Refer Section 5.1 Injury Severity Score

TABLE 4: TOTAL COST, CASE-STUDY ACCIDENTS MARCH 1976-MARCH 1977
(\$A 1976) AND (\$A 1980)

	Injury Severity Score (ISS ¹)						
	Fatal	15+	9-14	5-8	2-4	1	0
Number of Participants from Sample	9	24	59	88	105	226	465
Unit Cost (\$A 1976)	212,087	142,429	62,051	5,592	3,123	1,840	485
Unit Cost (\$A 1980)	307,158	205,553	88,815	8,017	4,495	2,629	715
Total Cost (\$A 1976)	\$10,449,464						
Total Cost (\$A 1980)	\$15,041,879						

Note: ¹ Refer Section 5.1 Injury Severity Score

the major part of the metropolitan area, was bounded on one side by the sea, on another side by a range of hills and defined on the third side by a major arterial road.

The case study accident costs may be increased by the ratio 100/8 to calculate the total costs for the Adelaide Inner Metropolitan Area. These costs are estimated to be \$130,618,300 (\$1976) and \$188,023,480 (\$1980). (Table 5)

In order to calculate the costs for all South Australian casualty accidents, the ratio of the number of case study accidents to statewide casualty accidents is used. In the 12 month period between March 1976 and March 1977, 7985 casualty accidents occurred in South Australia. The costs of the case study accidents are increased by the ratio 7985/304 to give the costs of serious road accidents in South Australia as \$274,470,280 (\$1976) and \$395,096,710 (\$1980). (Table 5)

These costs represent 4.32 per cent and 4.66 per cent of total household income in South Australia for 1976 and 1980 respectively (Table 6).

The measurable cost parameters that comprise the total cost estimates are discussed separately in the following chapter. Each parameter is examined, the conceptual basis for valuation is considered, and the source of information and the method of calculation are described for each component.

Section 7 presents a more detailed cost analysis by type of accident (e.g. car vs. car, motorcycle vs. vehicle, single car etc.) and by active participant primary error (assessed by a member of the In-Depth Study team as being the participant's major contributing factor to the cause of the accident). These cost distributions are of use in the allocation of funds to road safety and in the assessment of road safety proposals. The identification of the most costly types of accidents and the most costly source of 'driver' error can help in determining effective use of funds.

The discussion of the major cost parameters in Section 6 covers the cost estimation procedures used in this study. The Section provides a valuable insight to the more detailed cost analysis in Section 7.

TABLE 5: TOTAL COST, SERIOUS ROAD ACCIDENTS ADELAIDE INNER METROPOLITAN AREA AND SOUTH AUSTRALIA, MARCH 1976-MARCH 1977¹ (\$A 1976) and (\$A 1980)

Road Accidents in:	Total Cost	
	\$A 1976	\$A 1980
Sample - 304 accidents - Adelaide Inner Metropolitan Area	\$10,449,464	\$15,041,879
Adelaide Inner Metropolitan Area ²	\$130,618,300	\$188,023,480
South Australia ³	\$274,470,280	\$395,096,710

Notes: ¹ All costs based on 304 case study accidents March 1976-March 1977

² Costs of 304 case study accidents represent an 8% sample of total costs in Adelaide Inner Metropolitan Area, therefore case study accident costs increased by ratio of 100:8 to give total inner metropolitan costs.

³ During the period March 1976-March 1977, a total of 7985 casualty accidents occurred in South Australia. (Source: Road Traffic Board, South Australia *Road Traffic Accidents 1976 (and 1977)*). The cost of accidents in the case-study sample are increased by a ratio of 7985:304 to give total South Australian costs.

TABLE 6: TOTAL COST, SERIOUS ROAD ACCIDENTS - SOUTH AUSTRALIA, MARCH 1976-MARCH 1977 AS PERCENTAGE OF TOTAL HOUSEHOLD INCOME 1976 AND 1980^{1 2}

Year	Total Cost Serious Road Accidents - South Australia	Total Household Income South Australia	% Road Accident Costs Total Household Income
1976	\$274,470,280	\$6,359 million (1976/77)	4.32%
1980	\$395,096,710	\$8,478 million (1979/80) (Prov.)	4.66%

Notes: ¹ Australian Bureau of Statistics: Australian National Accounts - National Income and Expenditure (5204.0) 1979/80 Provisional results only. (Catalogues 5202.0 and 5206.0)

² No information on gross domestic product was available for South Australia but on the basis of Australian statistics Total Household Income is approximately 73% of G.D.P. Using this ratio accident costs are estimated to be 3.15% G.D.P. and 3.40% G.D.P. in South Australia for 1976 and 1980 respectively.

6. MAJOR COST PARAMETERS

6.1 LOST PRODUCTIVE CAPACITY AND LOST PRODUCTIVE CONTRIBUTION

6.1.1 FOREGONE INCOME - FATALITIES

The production losses resulting from both temporary and permanent interruptions to the productive contribution of each injured individual form the most significant component of total accident costs. Losses in future potential production inevitably decrease the consumption level available to the injured individual's family and other members of society and as such the aggregate effects on the community are significant and societal welfare is correspondingly reduced.

All degrees of injury imply at least some reduction in productive capacity and, as expected, current and future production losses increase with the degree of injury severity. In the extreme case of a fatal accident victim, the flow of productive contribution stops prematurely at the time of accidental death and the victim's productive capacity is immediately reduced to zero.

The societal welfare losses resulting from fatalities (and from temporary or permanent disabilities) are estimated by valuing the amount of lost production. This production is lost throughout the different sectors of the economy and in order to combine the diverse physical losses, production is measured in terms of market remuneration. This cost parameter measures the average present value of foregone future income¹ resulting from a road accident fatality (or from degree of impairment to an accident victim).

The productive input of those individuals undertaking activities for which no market remuneration is given has to be valued indirectly. Housewives and students are not compensated in the market and their productive contribution is measured using the opportunity cost principle - which approximates the income foregone in the market.

¹ Income includes revenue from all sources. It incorporates the return on past earnings and to properly include all losses in future production, the return on future production must be included. Income rather than earnings is the appropriate measure.

The calculations of 'income foregone' essentially follow the methodology developed by Faigin (1976). This methodology is superior to any practical alternative as it distinguishes the characteristic age and sex distributions of road accident fatalities and casualties from those of the general population.

CALCULATION OF FOREGONE INCOME - FATALITIES

The median age (within each age group category) is considered to be the exact age at death. For each median age (and corresponding age group) the average net present value of income foregone over the 'expected' lifetime of the accident victim is calculated. Although working life (or income earning period) is assumed to be between the ages of 15 and 64 years, and although the calculations of foregone income are made only to age 64, the derived overall average of income foregone per fatality should be applied similarly to all fatalities. The data required for this calculation procedure is listed as follows:

1. The annual full-time mean income by age groups is shown in Table 7.
2. The age distribution of road accident fatalities derived from South Australian statistics is shown in Table 8.
3. The choice of discount rate to be used in the calculation will have a significant bearing on the final results.

The calculation of the foregone income is based on the weighted average of annual full time income for each age category for males and females. The income figure is -

- a) increased by the given annual labour productivity rate (PR), and
- b) discounted back to the year of death by the given discount rate (DR).

These two steps are achieved simultaneously with the use of an effective discount rate (EDR) equal to the discount rate divided by the productivity rate. For example a 6% discount rate with a 3% productivity rate is equivalent to an effective discount rate

$$= \frac{1.06}{1.03} - 1 = 2.913\%$$

Future income is discounted because current income not immediately consumed can be invested

TABLE 7: ANNUAL FULL-TIME MEAN INCOME BY AGE GROUPS, SOUTH AUSTRALIA 1976¹

Annual Full-Time Mean Income - South Australia, 1976			
Age Group	Median Age ²	Male (\$A 1976)	Female (\$A 1976)
< 10	5	-	-
11-14	13	-	-
15-19	17	3734	3348
20-24	21	6399	5223
25-34	28	8503	4307
35-44	39	8884	4470
45-54	49	8540	4442
55-59	57	7806	3768
60-64	63	6386	2745

Notes: ¹ Australian Bureau of Statistics: Census of Population and Housing : Population and Dwellings 1976 (2421.0)

a) Mean income is calculated as the weighted average of the median income in each age category, excluding the 'not stated' and 'nil' income categories.

² Derived from Road Traffic Board of South Australia, *Road Traffic Accidents 1976*.

TABLE 8: AGE DISTRIBUTION OF ROAD ACCIDENT FATALITIES, SOUTH AUSTRALIA MARCH 1976-MARCH 1977.

Age Distribution of Fatalities - South Australia March 1976-March 1977 ¹						
Age Group	Males		Females		Total	
	Number	%	Number	%	Number	%
< 10	18	(75.0)	6	(25.0)	24	(8.1)
11-14	5	(62.5)	3	(37.5)	8	(2.7)
15-19	49	(83.0)	10	(17.0)	59	(19.9)
20-24	40	(88.9)	5	(11.1)	45	(15.2)
25-34	36	(100.0)	0	(0)	36	(12.2)
35-44	19	(95.0)	1	(5.0)	20	(6.8)
45-54	23	(92.0)	2	(8.0)	25	(8.4)
55-59	12	(85.7)	2	(14.3)	14	(4.7)
60-64	9	(64.3)	5	(35.7)	14	(4.7)
65+	35	(68.6)	16	(31.4)	51	(17.2)
	246	(83.1)	50	(16.9)	296	(99.9)

Note: ¹ Australian Bureau of Statistics : Road Traffic Accidents 1976 (and 1977) (\$14.1). Calculated on the basis of selected road users; drivers of motor vehicles, motor-cyclists, pedal cyclists and pedestrians.

to yield a return that exceeds the current value of the income. Also income earners require some reward for reducing their consumed income in the current period in favour of consuming it in a later period. Consequently an 'exchange rate' emerges between the current value of income and the value of income in the future. This exchange rate reveals a discount rate which is used to relate future income to current values. The higher the discount rate the lower the present value of foregone future income. The

productivity rate works in the opposite direction, increasing income over time.

The discount and productivity rates chosen in the calculation of foregone income have a substantial effect on the final results. The following analysis has been undertaken to indicate the sensitivity of the results to varying assumptions on the value of the two rates. The discount and productivity rates used in this study are shown below:

		%					
Annual Discount Rates (DR)	6.0	6.0	6.0	10.0	10.0	10.0	
Annual Productivity Rates (PR)	2.0	2.5	3.0	2.0	2.5	3.0	
Effective Discount Rates (EDR)	3.921	3.415	2.913	7.843	7.317	6.796	

To calculate the foregone income for fatalities in the age group 45-54:-

1. Use the median age = 49 years.
2. Begin analysis at age 49, use appropriate EDR from year 0 to year 15 (i.e. to age 64).
3. Calculate foregone income for each year using annual full-time mean income for each age group and sex. Total for each sex and calculate weighted average.

To calculate the foregone income for fatalities in the age group 11-14:-

1. Use the median age = 13 years.
2. Begin analysis at age 15 (i.e. the first year in which income is earned), use appropriate EDR from year 2 to year 51 (i.e. to age 64).
3. Calculate foregone income for each year using annual full time mean income for each age group and each sex. Total for each sex and calculate weighted average.

Table 9 summarises the foregone income amounts calculated for each age group at the six different combinations of discount rate and productivity rate.

Table 10 indicates the present value of income foregone for South Australian fatalities using an annual discount rate = 6 per cent and an annual productivity rate = 3 per cent. The weighted average foregone income per fatality of \$152,116 (\$ 1976) and \$220,340 (\$ 1980) are the results used in this study.

6.1.2 FOREGONE INCOME - NON-FATAL INJURIES (MINOR, MODERATE AND SERIOUS INJURIES)

The legacy of permanent disability varies with injury severity. Those individuals with higher degrees of injury severity are

expected to be more likely to suffer some degree of permanent disability and correspondingly higher losses in productive capacity.

The value of foregone productive contribution (both temporary and permanent) is dependent on a correct assessment of the residual disability within each injury level. In many cases it is difficult to objectively assess the future capabilities and the potential career opportunities of the injured but in this study a certain level of impairment has been assumed for each level of injury severity. The information on 'residual disability' and 'duration of restriction of normal activities' from the In-depth Study and further information from the Cost of Accident questionnaire has provided a sound basis on which to estimate the average levels of activity restriction for each ISS category.

DURATION OF RESTRICTION - AVERAGE NUMBER OF WORK DAYS LOST

The fact that an employer may continue to pay an injured worker is irrelevant as it is the interruption to the production flow that is important and in these cases the employer bears the full effect of such an interruption. The first step in calculating foregone productive contribution for persons with minor, moderate or serious injuries is to estimate the average number of work days lost. This component is calculated by two methods for each ISS category below 9¹. The first method makes use of In-depth Study information on the duration of restriction for all persons injured in the accidents. This is a measure of the length of time before the injured individual is able to resume 'normal' activities. For those employed in the work force it measures the time before returning to work, for students it

¹ The loss in productive capacity and contribution for all injured persons assigned an ISS greater than 9 are calculated using indirect information as the small sample size in this study did not facilitate accurate estimates. Refer Section 6.1.3.

TABLE 9: FOREGONE INCOME : ROAD ACCIDENT FATALITIES,
SOUTH AUSTRALIA 1976 (\$A 1976)

Age Group	% of Total Fatalities in Age Groups 0-64	Present Value of Average Lifetime Foregone Income ¹ - calculated at DR PR as shown.					
		6% D.R. 2% P.R.	6% 2.5%	6% 3%	10% 2%	10% 2.5%	10% 3%
< 10	9.8	98,686	113,776	131,618	37,499	42,172	47,537
11-14	3.3	126,626	140,243	155,872	65,260	70,501	76,351
15-19	24.1	154,475	168,813	185,090	87,468	93,387	99,942
20-24	18.3	166,050	179,600	194,821	100,453	106,433	113,007
25-34	14.7	169,669	181,242	194,017	110,266	115,960	122,145
35-44	8.2	135,187	141,863	149,025	97,325	101,274	105,474
45-54	10.2	90,888	93,707	96,649	73,176	75,188	77,279
55-59	5.7	45,058	45,747	46,449	40,324	40,902	41,491
60-64	5.7	9,919	9,943	9,967	9,743	9,766	9,789
Weighted Average Foregone Income per Fatality ²		129,896	140,337	152,116	79,799	84,351	89,354

Notes: ¹ Calculated at the median age for each age group, derived from *Road Traffic Accidents, 1976*, Road Traffic Board of South Australia. Calculated on the basis of weighted average of male and female incomes in each age group.

² The weighted average foregone income per fatality is the fatality weighted average of the estimates for all (0-64 years) age groups.

TABLE 10: PRESENT VALUE OF FOREGONE INCOME: ROAD ACCIDENT FATALITIES¹
SOUTH AUSTRALIA, MARCH 1976-MARCH 1977.
EFFECTIVE DISCOUNT RATE = 2.913%

Age Group	Fatalities in 0-64 Age Groups		Present Value of Average Gross Income Foregone Per Fatality in Age Group ² \$A 1976
	Number	%	
< 10	24	(9.8)	\$131,618
11-14	8	(3.3)	\$155,872
15-19	59	(24.1)	\$185,090
20-24	45	(18.3)	\$194,821
25-34	36	(14.7)	\$194,017
35-44	20	(8.2)	\$149,025
45-54	25	(10.2)	\$ 96,649
55-59	14	(5.7)	\$ 46,449
60-64	14	(5.7)	\$ 9,967
Weighted Average Foregone Income per Fatality ³ \$A 1976			\$152,116
Weighted Average Foregone Income per Fatality \$A 1980			\$220,340

Notes: ¹ Total number of fatalities in 0-64 age group in South Australia March 1976-March 1977 = 245.
Calculated at the median age for each age group, derived from *Road Traffic Board of South Australia Road Traffic Accidents 1976*.

² Discount Rate = 6% Productivity Rate = 3%. Calculated on the basis of weighted average of male and female incomes (e.g. 0-10 age group. \$131,618 is sum of 75% of male income average = \$147091 and 25% of female income average = \$85,199).

³ See ² Table 9

measures the time before returning to school and for others it measures the time before 'normal' activities are undertaken.

The second method involves direct use of questionnaire information. The answers to Section C Question 17 - "How many weeks after the accident did you start work?" were weighted such that the distribution of questionnaire results by ISS categories was representative of the distribution of all accident participants by ISS categories. An average of the questionnaire answers was calculated for each ISS category.

The results from both methods are summarised in Table 11, and Tables 12, 13 and 14 provide the details of calculation for the first method. There appears to be close association between the results from both sources of information. For those persons assigned an ISS = 1, the In-Depth Study data indicates an average of 2.1 work days would be lost and the Cost of Accident data indicates an average of 1.6 work days would be lost. For those persons assigned an ISS = 2-4 the estimated average number of work days lost was 9.7 (In-Depth study) and 5.0 (Cost of Accident). Both sources of information suggested a similar number of work days lost for those persons assigned an ISS = 5-8, 12.6 (In-Depth Study) and 12.3 (Cost of Accident). The In-Depth study results are based on a significantly larger sample size (921 persons) than the questionnaire results (which relate to 60 persons). The confidence we can place in the In-Depth study figures is correspondingly greater and these results are used in all future analyses.

The percentage of participants experiencing 'no restriction' was found to decrease progressively with higher injury severity. Of those persons assigned ISS = 1, 72.6 per cent suffered no restrictions, the corresponding percentages for persons assigned ISS = 2-4 and ISS = 5-8 were 24.0 and 3.9 per cent. (Tables 12, 13 and 14). From the persons assigned ISS = 1, only 2.5 per cent were restricted between one and three months. This percentage increased to 16.0 and 18.7 for those persons assigned ISS = 2-4 and ISS = 5-8 respectively. (Tables 12, 13 and 14).

The total value of lost production for non-fatal injuries relies on estimates of the extent of residual disability and estimates of the income lost as a result of that disability. The estimates of residual disability have been calculated in terms of average work days lost for ISS categories 1, 2-4 and 5-8. In the following section the income distribution by age and sex is determined for each of the three ISS categories. The income loss per day is then multiplied by the average number of work days lost to give estimates of the total productive contribution lost by persons in the ISS = 1, 2-4 and 5-8 categories.

INCOME DISTRIBUTION BY AGE AND SEX

The income levels (for each age and sex category) are weighted by the percentage of males and females in each age category for each ISS level. The relative percentages of males and females in each age group for each ISS category were derived from two sets of data. The first from Adelaide In-Depth study information which had the disadvantage of small sample size errors (Tables 16, 20 and 24), and the second from American data used by Faigin (1976). While drawn from a larger sample this data is American based and is not directly applicable to Australia. (Tables 18, 22 and 26).

The distribution of income and the weighted average of income earned has been presented for each level of injury severity, using both sets of data. For example, for persons aged between 15 and 64 years and assigned an ISS = 1, the weighted average of male and female incomes in \$A 1976 was \$5396, calculated using In-Depth study information (Table 16). The corresponding income figure calculated on the basis of Faigin's data was \$6207 (Table 18).

The income figures with the estimates of work days lost are used to calculate the value of lost productive contribution:- \$44.00 (In-Depth study - Table 17) and \$50.00 (Faigin - Table 19). For ISS categories 2-4 and 5-8, the values of lost productive contribution are presented in Tables 21 and 25 (In-Depth study information) and Tables 23 and 27 (Faigin).

Table 15 summarises both estimates of the total value of lost productive contribution for each level of injury severity.

The In-Depth study results are used in subsequent analyses because they incorporate the foregone income for accident casualties in the 15-19 year old group. This age group incorporates 33.8 per cent of all ISS = 1 victims, 25.7 per cent of all ISS = 2-4 victims and 39.4 per cent of all ISS = 5-8 victims. Consequently its omission in the American data causes considerable bias effects in an upward direction as the lower average income levels for the 15-19 age group tend to lower the total weighted average of foregone productive contribution in the Adelaide data.

Table 28 summarises the estimates of lost productive contribution used in this study.

6.1.3 FOREGONE INCOME - NON-FATAL INJURIES (SEVERE AND CRITICAL)

The assessment of lost productive contribution for those individuals with severe and critical injuries is a more complicated task. There is no Australian information that indicates percentages of impairment

TABLE 11: AVERAGE WORK DAYS LOST FOR ISS = 0, 1, 2-4 AND 5-8, SUMMARY

ISS Categories	In-Depth Study ¹	Cost of Accident Questionnaire		
	Duration of Restriction	Return to Work - Days after the Accident		
	Average Work Days Lost ²	Average Work Days Lost ³	Average Days Lost ³	
0	0	0	0	
1	2.1	1.6	1.6	
2-4	9.7	5.0	5.8	
5-8	12.6	12.3	16.3	

Note: ¹ These results are used in all following calculations.

² For details of calculation see Tables 12 to 14.

³ Average total days lost were obtained from questionnaire results and average work days lost were derived from these figures, taking account of weekends in every seven days.

TABLE 12: AVERAGE NUMBER OF WORK DAYS LOST, ISS = 1

Duration of Restriction ¹ ISS = 1	Per cent of Participants ISS = 1	Average Number of Work Days Lost
> 3 months	0	260
1-3 months	2.5	43
1 week < 1 month	4.0	10
< 1 week	20.9	3
No restriction	72.6	0
Weighted Average Number of Work Days Lost per Person (ISS = 1)		2.1

Note: ¹ Source : Adelaide In-Depth Accident Study 1975-79.

TABLE 13: AVERAGE NUMBER OF WORK DAYS LOST, ISS = 2-4

Duration of Restriction ¹ ISS = 2-4	Per cent of Participants ISS = 2-4	Average Number of Work Days Lost
> 3 months	0	260
1-3 months	16.0	43
1 week < 1 month	14.7	10
< 1 week	45.3	3
No restriction	24.0	0
Weighted Average Number of Work Days Lost per Person (ISS = 2-4)		9.7

Note: ¹ Source : Adelaide In-Depth Accident Study 1975-79.

TABLE 14: AVERAGE NUMBER OF WORK DAYS LOST, ISS = 5-8

Duration of Restriction ¹ ISS = 5-8	Per cent of Participants ISS = 5-8	Average Number of Work Days Lost
> 3 months	0	260
1-3 months	18.7	43
1 week < 1 month	32.0	10
< 1 week	45.4	3
No restriction	3.9	0
Weighted Average Number of Work Days Lost per Person (ISS = 5-8)		12.6

Note: ¹ Source : Adelaide In-Depth Accident Study 1975-79.

TABLE 15: VALUE OF LOST PRODUCTIVE CONTRIBUTION
FOR ISS = 0, 1, 2-4 AND 5-8. (\$A 1976)

ISS Categories	Value of Lost Productive Contribution \$A 1976 ¹	
	In-Depth Study ²	Faigin ³
0	\$ 0	\$ 0
1	44.00	50.00
2-4	199.00	245.00
5-8	248.00	319.00

Notes: ¹ Detailed calculations are shown in Tables 16 to 27.

² Per cent of male/female injured in each age group for each ISS category - derived from Adelaide In-Depth Accident Study 1975-1979.

³ Per cent of male/female injured in each age group for each ISS category - from Restraint Systems Evaluation Program, Washington, D.C., U.S. Department of Transportation, National Highway Traffic Safety Administration, special computer runs, unpublished, 1975. In Faigin (1976)

TABLE 16: DISTRIBUTION AND AVERAGE INCOME, ISS = 1, IN-DEPTH STUDY

Age Group	% of Total Ages ¹ 15-64	% of Age Group ¹		Annual Average Income \$A 1976		Average in \$A 1976 Weighted M & F
		M	F	M	F	
15-19	33.8	60.0	40.0	3734	3348	3580
20-24	23.0	73.2	26.8	6399	5223	6084
25-34	22.4	67.5	32.5	8503	4307	7139
35-44	7.9	50.0	50.0	8884	4470	6677
45-54	8.4	33.3	66.7	8540	4442	5807
55-59	2.8	0	100.0	7806	3768	3768
60-64	1.7	33.3	66.7	6386	2658	3899
Weighted Average						\$5396

Note: ¹ Source - Adelaide In-Depth Accident Study 1975-79.

TABLE 17: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 1, IN-DEPTH STUDY

Lost Productive Contribution Per Day:			
Weighted Average Income	=	\$5396	=
Number of Work Days in Year		260	= \$20.8
Total Lost Productive Contribution:			
Lost Days x Loss/Day = 2.1 (\$20.8) = \$44.0			

TABLE 18: DISTRIBUTION AND AVERAGE INCOME, ISS = 1, FAIGIN

Age Group	% of Total Ages ¹ 20-64	% of Age Group ¹		Annual Average Income \$A 1976		Average in \$A 1976 Weighted M & F
		M	F	M	F	
20-24	31.1	49.1	50.9	6399	5223	5800
25-34	32.9	51.2	48.8	8503	4307	6455
35-44	15.9	50.8	49.2	8884	4470	6712
45-54	12.6	50.0	50.0	8540	4442	6491
55-64	7.5	52.6	47.6	7096	3213	5262
Weighted Average						\$ 6207

Note: ¹ Source : Faigin (1976)

TABLE 19: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 1, FAIGIN

Lost Productive Contribution Per Day:			
Weighted Average Income	=	\$6207	= \$23.9
Number of Work Days in Year		260	
Total Lost Productive Contribution:			
Lost Days x Loss/Day	=	2.1 (\$23.9)	= \$50.00

TABLE 20: DISTRIBUTION AND AVERAGE INCOME, ISS = 2-4, IN-DEPTH STUDY

Age Group	% of Total Ages ¹ 15-64	% of Age Group ¹		Annual Average Income \$A 1976		Average in \$A 1976 Weighted M & F
		M	F	M	F	
15-19	25.7	63.6	36.4	3734	3348	3593
20-24	24.5	57.1	42.9	6399	5223	5894
25-34	23.2	45.0	55.0	8503	4307	6195
35-44	4.6	75.0	25.0	8884	4470	7781
45-54	8.1	28.6	71.4	8540	4442	5614
55-59	9.3	62.5	37.5	7806	3768	6292
60-64	4.6	0	100.0	6386	2658	2658
Weighted Average						\$5325

Note: ¹ Source : Adelaide In-Depth Accident Study 1975-79.

TABLE 21: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 2-4, IN-DEPTH STUDY

Lost Productive Contribution Per Day			
$\frac{\text{Weighted Average Income}}{\text{Number of Work Days in Year}}$	=	$\frac{\$5325}{260}$	= \$20.5
Total Lost Productive Contribution			
Lost Days x Loss/Day	=	9.7 x (\$20.5)	= \$199.00

TABLE 22: DISTRIBUTION AND AVERAGE INCOME, ISS = 2-4, FAIGIN

Age Group	% of Total Ages ¹	% of Age Group ¹		Annual Average Income		Average in \$A 1976 Weighted M & F
	20-64	M	F	M	F	
20-24	34.9	51.0	49.0	6399	5223	5823
25-34	27.4	27.5	27.5	8503	4307	7349
35-44	12.3	66.7	33.3	8884	4470	7414
45-54	14.4	57.1	42.9	8540	4442	6782
55-64	11.0	68.8	31.2	7096	3213	5885
Weighted Average						\$6582

Note: ¹ Source : Faigin (1976)

TABLE 23: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 2-4, FAIGIN

Lost Productive Contribution Per Day			
Weighted Average Income	=	\$6582	=
Number of Work Days in Year		260	= \$25.3
Total Lost Productive Contribution			
Lost Days x Loss/Day	=	9.7 (\$25.3)	= \$245

TABLE 24: DISTRIBUTION AND AVERAGE INCOME, ISS 5-8, IN-DEPTH STUDY

Age Group	% of Total Ages ¹ 15-64	% of Age Group ¹		Annual Average Income \$A 1976		Average in \$A 1976 Weighted M & F
		M	F	M	F	
15-19	39.4	53.6	46.4	3734	3348	3555
20-24	30.9	72.7	27.3	6399	5223	6078
25-34	22.6	43.8	56.3	8503	4307	6149
35-44	2.8	100.0	0.0	8884	4470	8884
45-54	1.5	100.0	0.0	8540	4442	8540
55-59	0	0.0	0.0	7806	3768	0
60-64	2.8	0.0	100.0	6386	2658	2658
Weighted Average						\$5120

Note: ¹ Source : Adelaide In-Depth Accident Study 1975-79

TABLE 25: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 5-8, IN-DEPTH STUDY

Lost Productive Contribution Per Day			
Weighted Average Income	=	\$5120	=
Number of Work Days in Year		260	= \$19.7
Total Lost Productive Contribution			
Lost Days x Loss/Day	=	12.6 (\$19.7)	= \$248.00

TABLE 26: DISTRIBUTION AND AVERAGE INCOME, ISS = 5-8, FAIGIN

Age Group	% of Total Ages ¹	% of Age Group ¹		Annual Average Income		Average in \$A 1976 Weighted M & F
	20-64	M	F	M	F	
20-24	34.9	51.0	49.0	6399	5223	5823
25-34	27.4	72.5	21.5	8503	4307	7349
35-44	12.3	66.7	33.3	8884	4470	7414
45-54	14.4	57.1	42.9	8540	4442	6782
55-64	11.0	68.8	31.2	7096	3213	5885
Weighted Average						\$6582

Note: ¹ Source : Faigin (1976)

TABLE 27: VALUE OF LOST PRODUCTIVE CONTRIBUTION, ISS = 5-8, FAIGIN

Lost Productive Contribution Per Day			
Weighted Average Income	=	\$6582	=
Number of Work Days in Year		260	= \$25.3
Total Lost Productive Contribution			
Lost Days x Loss/Day	=	12.6 (\$25.3)	= \$319.00

TABLE 28: VALUE OF LOST PRODUCTIVE CONTRIBUTION FOR ISS = 0, 1, 2-4 AND 5-8
(\$A 1976) AND (\$A 1980)

Value of Lost Productive Contribution	ISS			
	5-8	2-4	1	0
\$A 1976	248	199	44	0
\$A 1980	359	288	64	0

TABLE 29: INJURY SEVERITY AND PERCENT IMPAIRMENT ESTIMATES, AIS 4 AND AIS 5¹

AIS = 4	
Per cent of AIS=4 Injuries	Per cent of Impairment
2.5	90
9.5	50
1.3	25
86.7	20
100.0	Weighted Average 25
AIS = 5	
Per cent of AIS=5 Injuries	Per cent of Impairment
30.5	90
14.3	50
55.2	40
100.0	Weighted Average 57

Note: ¹ Source : Faigin (1976)

AIS Code	Scale Definition
4	SEVERE (Life threatening - Survival Probable)
5	CRITICAL (Survival Uncertain)

for permanent total disability or permanent partial disability. Consequently the following analysis of lost productive contribution is based on American data.¹ Further source data is gained from an unpublished medical assessment made in conjunction with the Comprehensive Injury Scale (CIS) of the potential per cent of physical impairment for different levels of injury severity.² Faigin (1976) presents the summary table (Table 29) and although it relates the per cent of impairment to AIS rather than ISS levels it is a valuable input for the calculation of foregone production for ISS levels greater than 9.

¹ Directorate of Aerospace Safety (1975) *Assessment of U.S. Air Force Injury and Fatality Cost Standards*. Norton A.F.B., C.A.
² American Medical Association, unpublished correlation between AIS and CIS.

The average value of lost productive contribution is calculated as a percentage loss in the average remaining lifetime income for each injured person. The percentage loss is directly related to the percentage of residual disability that each casualty is expected to sustain. On the basis of this American information it is assumed that those individuals with an ISS = 9-14 will suffer an average of 25 per cent residual disability and those individuals with an ISS=15+ will suffer an average of 57 per cent residual disability.

Table 30 summarises the present value of the average remaining lifetime income for each age group, at the six different combinations of discount rate and productivity rate. This table is essentially similar to Table 9, but the average income amounts are weighted by fatalities (to indicate income foregone per fatality) in Table 9, and weighted by casualties (to indicate remaining lifetime income per casualty) in Table 30.

TABLE 30: REMAINING LIFETIME INCOME : ROAD ACCIDENT CASUALTIES, SOUTH AUSTRALIA 1976 (\$A 1976)

Age Groups	% of Total Casualties in Age Groups 0-64	Present Value of Average Remaining Lifetime Income ¹ - calculated at DR PR as shown					
		6% DR 2% PR	6% 2.5%	6% 3%	10% 2%	10% 2.5%	10% 3%
0-10	8.1	96,940	111,726	129,204	36,928	41,517	46,783
11-14	4.5	132,352	146,708	163,192	67,775	73,279	79,426
15-19	30.0	151,666	165,699	181,628	86,054	91,853	98,274
20-24	19.7	155,015	167,570	181,671	94,189	99,738	105,837
25-34	15.6	142,630	152,331	163,034	92,783	97,566	102,760
35-44	8.2	117,820	123,614	129,829	84,922	88,357	92,008
45-54	8.3	81,660	84,177	86,804	65,832	67,631	69,501
55-59	3.0	42,704	43,355	44,019	38,226	38,774	39,331
60-64	2.6	10,490	10,515	10,540	10,303	10,327	10,352
Weighted Average Remaining Lifetime Income per Casualty ²		130,089	140,833	152,965	78,729	83,375	88,489

Notes: ¹ Calculated at the median age for each age group, derived from *Road Traffic Accidents 1976*, Road Traffic Board of South Australia. Calculated on the basis of weighted average of male and female incomes in each age group.

² The weighted average foregone income per casualty is the casualty weighted average of the estimates for all 0-64 (years) age groups.

In this study the value for the average remaining lifetime income, weighted by fatalities (Table 9) and weighted by casualties (Table 30) is calculated using a discount rate = 6 per cent and an annual productivity rate = 3 per cent. These figures are summarised in Table 31.

The average value of lost productive contribution is obtained by reducing the expected remaining lifetime income by the

percentage of permanent impairment. For example, persons assigned ISS = 9-14 will suffer 25 per cent residual disability and the value of lost productive contribution is calculated as 25 per cent of remaining lifetime income (weighted equally by casualties and fatalities to take account of the severity of injury). Table 32 gives the average value of lost productive contribution for ISS = 9-14 and ISS = 15+ categories.

TABLE 31: AVERAGE REMAINING LIFETIME INCOME BY AGE GROUP¹ (\$A 1976)

Age Group	Weighted by Fatalities	Weighted by Casualties
0-10	\$131,618	\$129,204
11-14	155,872	163,192
15-19	185,090	181,628
20-24	194,821	181,671
25-34	194,017	163,034
35-44	149,025	129,824
45-54	96,649	86,804
55-59	46,449	44,019
60-64	9,967	10,540
Weighted Average	\$152,116	\$152,965

Note: ¹ Discount Rate = 6%, Productivity Rate = 3%,
Effective Discount Rate = 2.913%

TABLE 32: AVERAGE VALUE OF LOST PRODUCTIVE CONTRIBUTION
BY PER CENT RESIDUAL DISABILITY - ISS=9-14 AND 15+

ISS Categories	% Disability	Foregone Income Weighted by Fatalities	Foregone Income Weighted by Casualties	Weighted Average Foregone Income ¹ \$1976	Weighted Average Foregone Income ¹ \$1980
9-14	25	\$152,116 x .25 = \$38,029	\$152,965 x .25 = \$38,241	\$38,135	\$55,239
15+	57	\$152,116 x .57 = \$86,706	\$152,965 x .57 = \$87,190	\$86,948	\$125,944

Note: ¹ Fatalities and casualties are equally weighted to allow for the severity of injury.

6.1.4 FAMILY AND COMMUNITY LOSSES

The productive contribution of individuals can be considered in two main categories. First, the contribution made during the regular eight-hour day, within the period commonly known as 'working hours'.¹ Secondly the contribution made 'after hours'.

The cost parameter measuring 'foregone income' has already provided estimates of the value of production within the first category. Relying upon a knowledge of market remuneration (for those in the labour force) and the opportunity cost for those making a non-market contribution the value of productive contribution within the 'working day' has been calculated.

In addition to the recognised contribution from the eight-hour day, the value of other activities that continue beyond those working hours must be considered. Such activities are conducted within two primary areas: first in the home and family environment and secondly within the community as a whole.

In the home and family sector the unpaid contributions of individuals will include the following activities. Home maintenance and improvements, home decoration, child care, meal preparation and the growing of fruit, vegetables and flowers. The contributions made within the community will include community volunteer services, the help to and from neighbours and the value to the neighbourhood of any home crafts, repairs or trade conducted within households.

Halkett (1976) has made a study of how Adelaidians make use of their own gardens. From his sample he concludes two-thirds of households keep pets or chickens, 90 per cent of households grow some fruit or vegetables, approximately 83 per cent grow flowers and ten per cent of households grow a quarter or more of their needs.

In the 1974 Boyer Lectures (Stretton 1974), Stretton has emphasised the importance of home and neighbourhood contribution in encouraging domestic economic growth. The work done in the domestic sector contributes to national productivity, national income and the real wealth of Australia. However, the national accounting system does not include the value of the production that is exchanged outside the commercial market. The output of the domestic economy remains unvalued as it is not marketed for money. Consequently serious errors in calculation of gross domestic product can be made on the assumption that the output of the domestic economy is valueless.

¹ It should be understood that the contribution made within working hours is not necessarily paid work. The proportion of the work done in the commercial system will be remunerated but the proportion of work conducted outside the commercial system will be unpaid.

In this study an attempt has been made to place a realistic value on the domestic contribution that is lost when an individual sustains injuries that result in temporary or permanent impairment. The wide diversity in extent and quality of domestic activities and the lack of any market in which the activities are exchanged render them quite difficult to value. There are, however, several studies that have estimated the extent to which national income and wealth would be increased by including a measure of the total unpaid domestic contribution.

Morgan (1966) states that gross national product would be increased by 38 per cent with the inclusion of all unpaid work. Using the same data as Morgan, Sirageldin (1966) estimates that the value of housework and home production would increase the average families' disposable income by 43 per cent. Gronau (1973) estimates the price of a housewife's time to lie between -20 per cent and +5 per cent of the average wage of working women.

Stretton (1976) considers the seriousness of the omission of domestic production from the national accounts. He states "...instead of cooking dinner for her own lot, each housewife would feed her neighbours at regular restaurant rates; then they'd cook for her family and get their money back. We'd do each others' housework and gardening at award rates. Big money would change hands when we fixed each others' tap washers and electric plugs at plumbers and electricians' rates. Without a scrap of extra work the gross national product would go up by a third over night ..."

These percentage values of unpaid domestic contribution are not directly relevant to this study as they do not distinguish the work done outside normal working hours and they usually do not incorporate the community or volunteer services that are an important part of non-market contribution.

Another area of research that can be used to shed light on this problem is the study of the value of 'leisure' time or travel time. In this sense a value of time spent in 'unpaid activities' is made and these valuations provide useful 'orders of magnitude' in calculations for this study. Beasley (1965) adopted an approach using time and money tradeoffs made by urban commuters in their choices between different types of public transport and between private cars and public transport. He found travel time to be valued at approximately 33 per cent of the wage rate for public transport users and for those on higher incomes the value of time was estimated to be just less than 50 per cent of the wage rate. Quarmby (1967) used a discriminant analysis based on car owners in Leeds to explain the choices made between private car and public transport use. His rather cautious conclusion was that the average value of time in this context is between 20-25 per cent of the wage rate and is constant

over all wage rates. Lisco (1968) using multiple probit analysis concluded commuters value their time on the average between 40-50 per cent of the wage rate. Cesario (1976), in the most relevant study, made some rather tentative conclusions that the value of time with respect to non-work travel is between 25 per cent and 50 per cent of the wage rate.

The total value of home, family, community and volunteer services is estimated to be equivalent to approximately 35 per cent of income earned in the 40 hour week and 35 per cent of 'foregone income' is assumed to be a realistic measure of the losses in work and services that would otherwise be performed outside the 40 hour work week. The results used in this study are given in Table 33 and they are calculated as 35 per cent of foregone income for each injury severity level.

6.2 ABSORPTION OF CURRENT RESOURCES AND SERVICES IN RESTORATIVE ACTION

6.2.1 AMBULANCE COSTS

Those persons sustaining injuries in road accidents who require medical attention are usually transported in an ambulance from the scene of an accident. As stretcher or sitting patients they use ambulance services during the journey to hospital.

The use of ambulances in vehicle accidents comprises only a small proportion (approximately five per cent) of total ambulance services in Metropolitan Adelaide and to properly estimate the resource cost

of ambulance use solely for road accident victims, the distinction between fixed and variable costs of operation must be made.

The fixed costs of the Ambulance Service are unaffected by the number of road accidents attended. Such costs include all personnel costs (both operational and administrative), occupancy expenses, marketing expenses, finance expenses and most operational and administrative costs. Attendance at accident scenes can affect vehicle operating costs, the rate at which medical supplies are exhausted and some minor administration costs. In an incremental sense such costs are of minor significance in the overall cost structure of the service.

The aim in this study is to identify the resource costs associated with the use of ambulances in the 304 case-study accidents. However the problem in allocating costs (fixed and semi-variable) to such trips has been rendered impracticable as the joint nature of the majority of the costs would provide, at the best, only an arbitrary guide.

As an alternative the fee for service raised by St. John has been selected for our purpose. The St. John Council for South Australia Inc. charged users in the Metropolitan Area during 1976 a fixed \$28.50 call out fee plus 50 cents for each patient-kilometre travelled.

It is inappropriate to interpret these charges as a measure of the incremental costs of road accident attendance or as a measure of the costs involved in operating the total ambulance service. Rather, the charges are seen to lie between these two estimates and they are considered a reasonable measure in the

TABLE 33: HOME, FAMILY, COMMUNITY AND VOLUNTEER LOSSES BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Home, Family, Community and Volunteer Losses \$ 1976	53,241	30,432	13,347	87	42	15	0
Home, Family, Community and Volunteer Losses \$ 1980	77,119	44,080	19,333	126	101	22	0

light of the cost allocation problems involved in determining the exact use of ambulance resources in attending vehicle accidents. The charge varied positively with distance travelled and the degree of injury severity had minimal effect (if any) on the total cost per ambulance journey. However as injury severity increases, the percentage of injured persons requiring ambulance services also increases and this explains the rising average ambulance costs over the range of ISS, e.g. not every person injured with ISS=1 or 2-4 will require an ambulance, therefore the total ambulance costs for ISS=1 or 2-4 are averaged over a greater number of people than those actually making use of the service.

In 28 of the case-study accidents an ambulance was called to the scene but was not required. No charge was made for this service and consequently the cost figures in this study do not include the operational costs associated with such trips. The omission of these additional costs is considered to make only a marginal difference to the average cost figures provided.

Average ambulance costs have been derived from the Cost of Accident Questionnaire, Section E, Question 18:-

<i>As a result of the accident did you require ambulance services</i>	YES / NO
<i>If YES - what was the cost of these services?</i>	\$.....'

The average ambulance costs were calculated for each ISS category and the questionnaire responses were weighted so the distribution of responses within each ISS category was representative of the accident population distribution within each category.

The questionnaire results indicated there was a progressive increase in average ambulance costs to a maximum of about \$34.00. The small sample of persons with ISS=15+ gave an apparently aberrant result and for this reason a "curve-of-best-fit" was fitted to the data and the final results are listed in Table 34.

As there were only nine fatal cases, the information on their ambulance transport was insufficient to determine reasonable average costs. It was assumed that the ambulance costs for fatally injured persons was equivalent to that of persons assigned an ISS=15+. In fatal cases, the operating costs of the ambulance are probably marginally higher than those in serious injury cases as the ambulance usually transports the body from the hospital to the morgue.

Further detail on the characteristics of ambulance costs may be found in Appendix A.

6.2.2 HOSPITAL AND MEDICAL TREATMENT - INTRODUCTION

A priori we would expect the cost of hospital and medical attention to be positively associated with the severity of injury.

The Injury Severity Score (ISS) has been used to indicate a measure of overall injury severity. (Refer Section 5.1 Injury Severity Score.) Over 50 per cent of the persons who were involved in the case-study accidents were injured, although in many cases their injuries were relatively minor.

Table 35 lists the distribution of overall injury severity for each category of road user involved in the accidents covered by this study.

Pedestrians sustained a higher average severity of injury than any other type of road user when the percentage who were injured to a degree rated greater than ISS = 9 is considered. These percentages are 41.9 for pedestrians, 41.1 for pedal cyclists, 30.9 for motorcyclists and 5.1 for all car occupants including commercial vehicle occupants.

In the case study accidents 61 per cent of the pedestrians had an ISS greater than four. The corresponding percentages for the other road users were:- pedal cyclists 61 per cent; motorcyclists 53 per cent; car and commercial vehicle occupants 12 per cent.

Further detail on the body regions injured (and objects causing injury) can be found in the Adelaide In-depth Accident Study reports on pedestrians, pedal cyclists, motorcyclists, commercial vehicle and car occupants. (See Parts 2, 3, 4, 5 and 6 respectively).

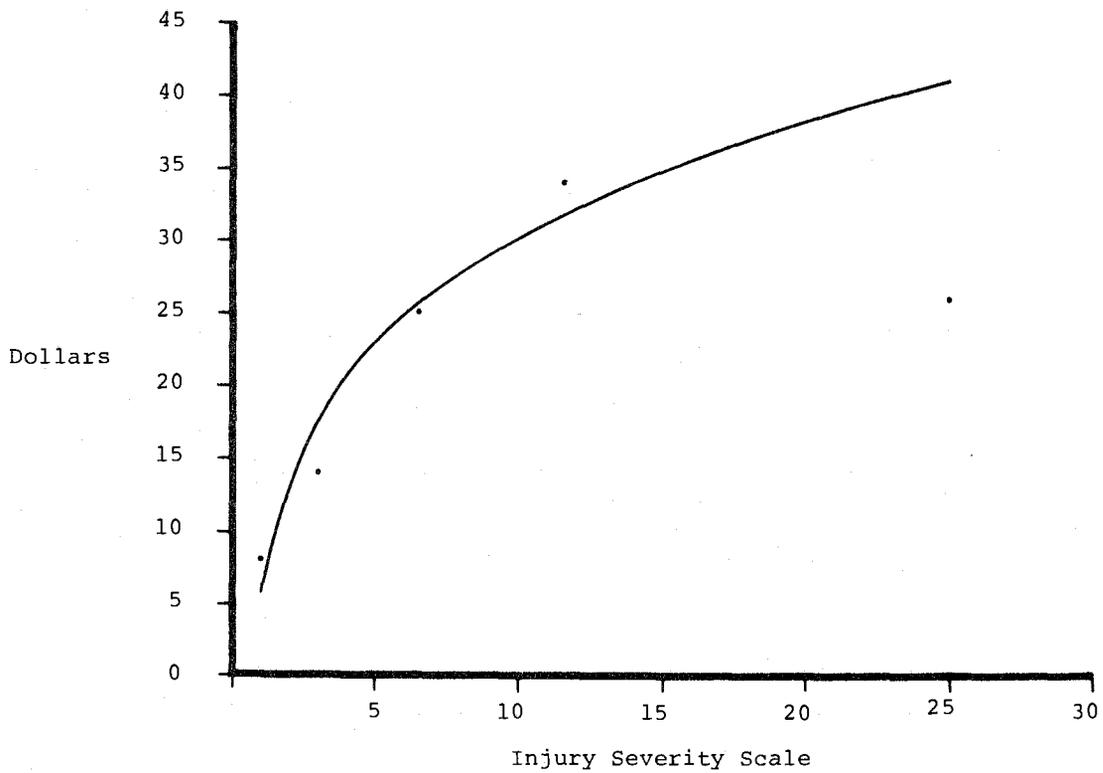
Alternative measures of injury severity have been recorded in this study, such as the period after the accident in which the road user was unable to resume his or her normal activities. This is a rather subjective measure with some individuals determined not to let their activities be interrupted any longer than necessary while others with similar injuries may take the opportunity to extend their recovery period in order to 'fully' recover before returning to normal activities.

The frequency of injury to particular body regions varied with the type of road user. Pedestrians sustained 80 per cent of their injuries to the extremities (arms and legs) or to the head or face. This percentage is reduced to 58 when only severe injuries are considered. For pedal cyclists also, 80 per cent of the injuries sustained were to the extremities or to the head or face. Concussion accounted for 70 per cent of the head injuries and concussion and fractures of the femur were the most common severe injuries. For motorcyclists 46.2 per cent of the

TABLE 34: AVERAGE AMBULANCE COSTS BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Ambulance Costs	ISS (x)						
	Fatal	15+	9-14	5-8	2-4	1	0
Questionnaire data \$1976	Assume same as 15+	26	34	25	14	8	0
Curve of Best Fit ($y = 10.62\ln x + 5.7$)	Assume same as 15+	41	32	26	18	6	-
Curve of Best Fit \$1980	Assume same as 15+	60	47	38	27	9	-

FIGURE 1: AMBULANCE COSTS BY INJURY SEVERITY
CURVE OF BEST FIT



ISS (x)	0	1	3	6.5	11.5	25
Ambulance Costs (y) (Questionnaire)	0	8.00	14.00	25.00	34.00	26.00
$y = 10.62\ln x + 5.7$	-	5.87	17.53	25.76	31.80	41.07

TABLE 35: DISTRIBUTION OF INJURY SEVERITY BY TYPE OF ROAD USER

Type - Road User	ISS							Total %
	Fatal	15+	9-14	5-8	2-4	1	0	
Car Drivers	0.2	2.0	3.8	7.1	9.8	16.7	60.4 ¹	48.1
	0.1	0.9	1.8	3.4	4.6	7.9	29.4 ²	
Pedal Cyclists	0	17.6	23.5	11.8	23.5	23.5	0	1.8
	0	0.3	0.4	0.2	0.4	0.4	0	
Motor Cyclists	4.4	1.5	25.0	23.5	11.8	29.4	4.4	7.1
	0.3	0.1	1.8	1.7	0.8	2.1	0.3	
Passengers	0.6	1.1	2.5	7.5	10.5	31.5	46.4	38.5
	0.2	0.4	0.9	2.8	4.0	12.0	18.1	
Pedestrians	7.0	11.6	23.3	18.6	23.3	14.0	2.3	4.5
	0.3	0.5	1.1	0.8	1.1	0.6	0.1	
Total %	0.9	2.3	6.0	8.9	10.9	23.0	47.9	100

Notes: Source - Derived from Adelaide In-Depth Accident Study 1975-79
Excluding unknowns

¹ First row gives percentage of road-users in each ISS category.

² Second row gives percentage of all participants in each ISS category.

injuries sustained were to the lower extremities. The percentage of overall injury severity ratings of severe to critical was considerably less (23.7 per cent) for motorcyclists than it was for pedal cyclists (34.7 per cent) or pedestrians (45.4 per cent). The comparable percentage for car occupants was significantly lower again (3.9 per cent).

For those persons injured in car accidents the head, knees, face and chest were the most frequently injured body regions accounting for 59 per cent of the injuries. Chest injuries accounted for 20 per cent of the severe injuries to car occupants and the other body regions most frequently severely injured were the head (16 per cent) and face (12 per cent).

In the commercial vehicle accidents, the most frequently injured body region, accounting for almost a quarter of all injuries, was the knee - these injuries mainly involved minor bruises and abrasions.

Hospital and medical treatment is considered and costed under six categories:

- On-site treatment
- Hospital In-patient treatment
- Hospital Out-patient treatment
- Hospital Paramedical treatment
- Private Doctors treatment
- Additional Medical treatment

In the study 338 persons were taken to hospital for treatment and of those exactly half, 169 persons, were admitted and the other 169 persons were treated in the casualty section and allowed to leave.

Each type of treatment is discussed below.

ON-SITE TREATMENT

This cost parameter covers the first-aid treatment given to those persons with minor injuries not requiring hospital attention. The St. John Ambulance officers were able to treat minor cuts or bruising at the scene of the accident and the resource cost imputed for such treatment was \$10.00 (\$A 1976), equivalent to the estimated resource costs of a private medical consultation for a minor injury. On-site treatment was required by persons with injury severity ratings of less than or equal to 2. The results are summarised in Table 36.

HOSPITAL INPATIENT, OUTPATIENT AND PARAMEDICAL TREATMENT

The cost of hospital and medical attention will tend to be positively related to

- the length of stay in hospital
- the intensity of treatment in hospital
- the amount of medical attention and care required after leaving hospital

TABLE 36: AVERAGE COST OF ON-SITE TREATMENT BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
On-site treatment \$1976	0	0	0	0	2	4	0
On-site treatment \$1980	0	0	0	0	3	6	0

- the rate of recovery after leaving hospital.

These four factors suggest that the cost of hospital and medical attention will increase with the degree of injury severity, however, this is not always the case. Some medical services are absorbed in order to confirm a diagnosis and if there is uncertainty in diagnosis, the medical services absorbed may be far greater than the injury would usually require.

An injury that is not immediately obvious may be assigned a low ISS. For example, neck and back injuries often develop sometime after the accident and although they may have been assigned a low (or even zero) ISS rating, the injury may persist for months or years. In these cases the on-going costs associated with a low ISS can be higher than the costs in those cases where the ISS is high but the rate of recovery is relatively fast, with a rapidly diminishing intensity of treatment, e.g. a fractured femur.

The pricing of hospital and medical services is subject to many distortions. Although vehicle accident patients are charged a higher fee than other patients, the actual fee charged to patients rarely covers the full costs of the service. Government subsidies are concealed and the distortions resulting from some fee waivers or bulk-billing of insurance companies are rarely specified.

All the medical resources absorbed in treating road accident victims have an opportunity cost in the sense that they could be used in treating other patients. Every medical service that is rendered has a social cost and it is this cost, rather than the actual price paid that is estimated in this study.

Table 37 contains a summary of the various types of expenditure that were included to calculate the average social cost per hospital bed per day during the period March 1976-March 1977. The resultant figure of \$163.00 per bed per day applies to the major public hospitals:

the Royal Adelaide, The Queen Elizabeth, Adelaide Childrens, Flinders Medical Centre and Modbury hospitals. The charge per bed per day made to patients during that period is summarised in Table 38.

Each hospital that received road accident victims from the case-study group was contacted. An appointment was made with the Administrator to discuss the possibility of access to the hospital cost records relevant to each injured person in the study. In every case, this access was approved and the following information sheet was completed for each of the 169 persons admitted to hospital and for another 169 persons treated in casualty (Table 39.)

The actual fee charged to patients was not used as a basis for full social costing, other than to identify any additional hospital or medical services that were rendered but not included in the average fee charged per bed per day.

The full social costs calculated for inpatient, outpatient and paramedical treatment are based on the time spent in hospital costed at the average social cost per bed per day or the average social cost per visit, i.e. \$163.00 per day for inpatients and \$32.50 per casualty or outpatient visit (Table 38).

The actual social costs of inpatient treatment are generally higher in the days immediately after the accident, when diagnosis is confirmed, initial corrective surgery is performed and intensive care and vigilant attention may be necessary. In the following days the actual costs are expected to fall as the needs and demands of the patient tend toward general recovery care. The average social cost used in this study is expected to take account of this reduction in actual per day costs during the injured person's stay in hospital.

The information on hospital costs was collected for every person who had been admitted to hospital or had received casualty or outpatient treatment. These

TABLE 37: SUMMARY OF THE EXPENDITURE COMPONENTS OF THE
AVERAGE SOCIAL COST PER HOSPITAL BED PER DAY

Salaries and Wages	Catering
Medical Supplies	Cleaning Materials, Crockery Hardware
Pharmaceutical Supplies	Linen, Materials, Bedding etc.
Laboratory Supplies	Water and Gas
Repairs and Maintenance	Workmens Compensation
Laundry	Additional Equipment
Power, Lighting and Heating	Uniforms
Air conditioning	Postage
Travelling Expenses	Advertising
Transport	Library Books
Insurance	Theatre Supplies
Superannuation	Surgical
Telephone	Outside Pathology Services
Waste Disposal	Other Sundry Items
Pest Control	ADP Charges
Window Cleaning	Equipment Rental and Maintenance Contracts
Printing and Stationery	Lift Maintenance

TABLE 38: AVERAGE SOCIAL COST AND PRICE CHARGED PER HOSPITAL BED PER DAY,
SOUTH AUSTRALIA, MARCH 1976-MARCH 1977

Time Period	Social Cost					
	Compensible Inpatient	Compensible Casualty & Outpatient	Non-Compensible Inpatient	Non-Compensible Casualty & Outpatient	Inpatient	Casualty and Outpatient
To 1.10.76	\$36.00	\$10.00 \$ 3.00 (OP)	-	-	\$163.00	\$32.50
1.10.76 - 1. 7.77	\$115.00	\$ 7.50 \$ 7.50 (OP)	\$60.00	-	\$163.00	\$32.50

Source : From information supplied by major public hospitals in Adelaide for period 1976/1977.

TABLE 39: INFORMATION DERIVED FROM HOSPITAL RECORDS

Duration of Stay in Hospital (including subsequent visits)

Fee Charged for Stay in Hospital

Number of Outpatient Visits

Fee Charged for Outpatient Visits

Number of Visits to Paramedical Services

Fee Charged per Paramedical Visit

Cost of Medical Prescriptions Supplied

Cost of Medical Prescriptions Ordered and Purchased Outside Hospital

Cost of Medical Appliances, e.g. Crutches

Membership of Health Fund YES / NO Name:

Which Hospital and Medical Tables

Breakdown of Payment of Hospital Account

Who Pays				
Private Individual	Company	Private Insurance Company	State Government Insurance Commission	Government

costs were aggregated under the seven ISS categories and the average cost of treatment was calculated for each injury severity level. The results are summarised in Table 40.

The incidence of road accident costs is examined in Appendix A of the report but at this stage let us look at the incidence of all the hospital inpatient, outpatient and paramedical costs which have already been estimated and discussed in this section (Table 41).

TABLE 40: AVERAGE SOCIAL COST OF INPATIENT, OUTPATIENT AND PARAMEDICAL HOSPITAL TREATMENT BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter Type of Hospital Treatment	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Inpatients \$1976	195	6135	2074	469	275	49	0
Outpatients \$1976	0	235	165	40	34	23	0
Paramedical \$1976	0	120	120	25	9	1	0
Inpatients \$1980	255	8022	2712	613	360	64	0
Outpatients \$1980	0	307	216	52	44	30	0
Paramedical \$1980	0	157	157	33	12	1	0

TABLE 41: TOTAL HOSPITAL COSTS - SOURCE OF FUNDS

Total Hospital Costs - Source of Funds	Number of Respondents	% of Respondents with Hospital Costs
Insurance Company	153	53.3
Private Patient/ Individual	50	17.4
Health Fund	29	10.1
Government 'free treatment'	27	9.4
Other	27	9.4
Pension	1	0.3
Total	287	99.9 ¹

Note: ¹ Rounding Error

PRIVATE DOCTORS' TREATMENT

This cost covers the medical attention not associated with hospital care. All the costs of hospital care were directly available from hospital records but for those persons who were attended by their family doctor or in cases where external doctors were consulted after hospital discharge, the additional medical costs have been estimated on the basis of information given in the Cost of Accident Questionnaire.

The relevant questions are found in Section A, Questions 1 and 3:-

- '1. Did you see a doctor(s) other than at a hospital for treatment of conditions related to the accident? YES/NO
If YES - how many times did you see the doctor(s)?
3. What was the total cost to date of all doctors visits (outside hospital) relating to your accident injuries including X-rays, tests, etc.? \$.....'

The cost of additional treatment ranged from a minimum of \$6.00 to a maximum of \$800.00. These costs were sustained by a car driver and a car passenger respectively, both were involved in two-car collisions.

For those persons with ISS=1 the cost of property damage usually outweighs the cost of medical treatment as one casualty visit, a private medical appointment or on-site first aid treatment is usually all that is required. There are, however, cases where persons with an ISS=1 require significant amounts of medical treatment and incur large medical costs. The most common cause of this is neck pain, developing weeks after the accident but persisting for months and in some cases years.

The average cost of private doctors' treatment tends to increase with injury severity to a maximum at moderate-serious injury levels. The cost of private treatment then tends to fall quite significantly for seriously and critically injured persons; it is suggested that these patients form a stronger association with the hospital medical staff as they spend longer in hospital and consequently they complete their treatment within the hospital and the cost is incorporated in total hospital costs.

Further analysis of the characteristics of additional private doctors' treatment is given in Appendix A, where the questionnaire results are discussed in greater detail.

Table 42 summarises the average costs of additional private doctors' treatment.

ADDITIONAL MEDICAL TREATMENT

This cost parameter covers any 'additional' treatment external to hospital treatment.

It incorporates the services provided by dentists, physiotherapists, chiropractors, occupational therapists and psychiatrists and information on such treatment is derived from the Cost of Accident Questionnaire Section A. Questions 5 & 6:-

- '5. As a result of the accident did you have any other treatment (outside hospital) e.g. from dentist, physiotherapist, chiropractor, occupational therapist or other? YES / NO
If YES - for which injury?
- which service?
- Dentist - how many visits?
 - Physiotherapist - how many visits?
 - Chiropractor - how many visits?
 - Occupational therapist - how many visits?
 - Psychiatrist - how many visits?
 - Other : please specify
6. What was the total cost of this 'other' treatment for injuries? \$.....'

The results show that the cost of this additional treatment increases with injury severity to a maximum for severe (life threatening) injuries and then remains approximately the same for critical injuries. There is no evidence of the cost of this treatment decreasing at the severe-critical injury levels as was obvious with additional private doctors' treatment.

There are several reasons for this. The hospital doctor who is responsible for the patient throughout the recovery period may be willing to refer the patient for non-hospital ancillary medical care. This may be done so the patient can reduce travelling time and costs by receiving 'local' ancillary treatment.

In some cases the additional treatment will not be provided by the hospital, e.g. chiropractors and dental services, and the patient is obliged to use non-hospital services. In this respect we would expect the costs of 'additional' medical treatment to increase with injury severity. Table 43 summarises these results.

Further detail on the characteristics of 'additional' medical treatment may be found in Appendix A.

6.2.3 ADDITIONAL CARE

Many of the injured persons were discharged from hospital before their recovery was complete and on returning home they still required attention and care.

Generally the responsibility for such care falls on the family and friends of the injured person. The time spent by these people to ensure the patient is properly supervised at home often necessitates them taking time away from their regular activity - work, home duties or schooling. In addition to providing home care, the relatives (or friends) may

TABLE 42: AVERAGE COST OF PRIVATE DOCTORS' TREATMENT BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Private Doctors' Treatment \$1976	0	7	20	47	30	11	1
Private Doctors' Treatment \$1980	0	10	29	69	44	16	1

TABLE 43: AVERAGE COST OF 'ADDITIONAL' MEDICAL TREATMENT BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Additional Medical Treatment \$1976	0	66	65	36	29	7	0
Additional Medical Treatment \$1980	0	97	96	53	43	10	0

be needed to take the persons for further medical or rehabilitative treatment.

The majority of injured persons do not employ a home nurse to provide additional care (see details in Appendix A) and consequently, by relying on the service of family and friends, there is no 'market value' for the cost of additional care. Therefore the costs used in this study are estimated using the opportunity cost of the time spent by relatives (and friends) with the injured person.

The average length of time spent in additional care of patients has been calculated for specified levels of injury severity, using information from The Cost of Accident Questionnaire, Section B, Questions 3, 4 and 5:-

3. When you arrived home did you need any extra looking after? YES / NO

4. When you arrived home who looked after you? Please tick correct box(es)

- Member of your family (including relatives) who usually lived with you at the time of the accident.
- Member of your family (including relatives) who did not usually live with you at the time of the accident.
- Neighbour

- Home nurse who was paid
- Other : please specify

5. How many weeks did the above person spend looking after you? weeks'

The answers to Question 5 have been summarised in Table 44 in which the amount of extra care required is expressed in terms of the number of days of attention required. The relatively small response rate in the ISS=5-8 category has given the rather aberrant result of 2.74 additional days of care which is a lesser amount than was required for the ISS=2-4 category. To compensate for the errors of small sample size a 'curve-of-best-fit' has been applied to the questionnaire results to give a more realistic indication of the true relationship between injury severity and amount of extra care required.

The cost of additional care is calculated on the basis of the results from the curve of best fit. The number of days of extra care in each category is multiplied by \$131.00, equal to the average weekly earnings for all adult females in South Australia during 1976¹. This provides

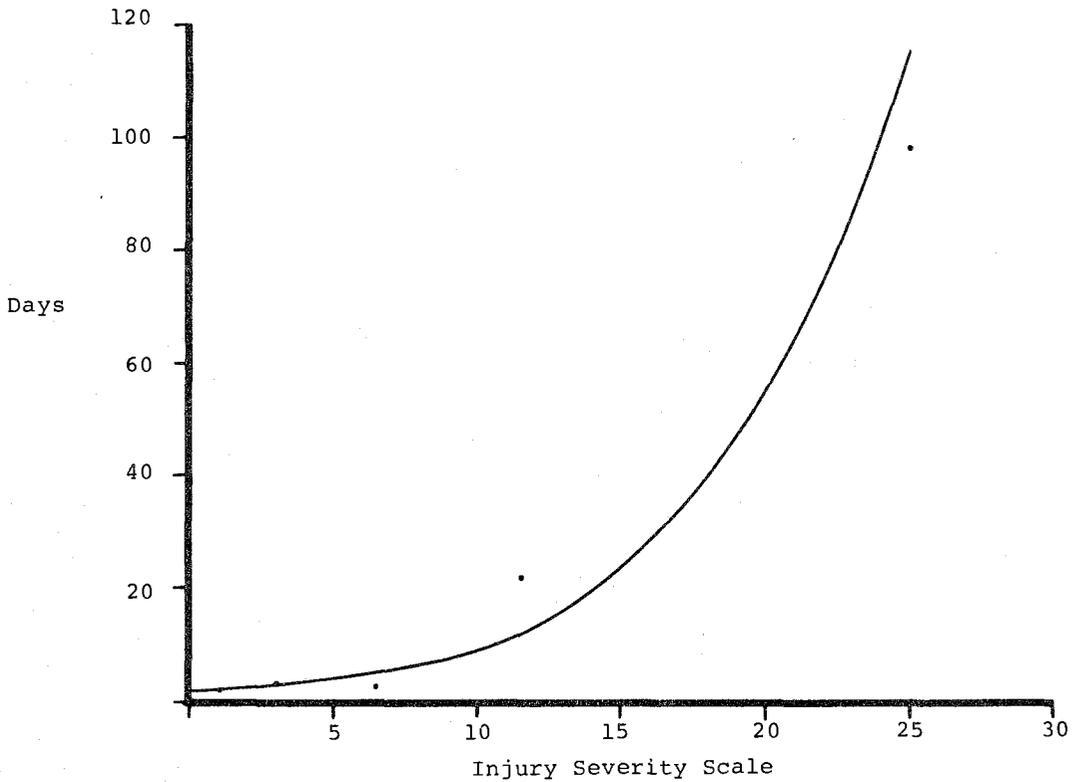
¹ Australian Bureau of Statistics: Earnings and Hours of Employees - Australia 1976 (6304.0). Assume five working days are required to earn \$131.00 per week.

TABLE 44: ADDITIONAL CARE - NUMBER OF DAYS¹ BY INJURY SEVERITY

Additional Care (Days) (y)	ISS (x)						
	Fatal	15+	9-14	5-8	2-4	1	0
Questionnaire data	0	98	22	2.74	3.28	1.83	0
Curve of Best Fit ($y = 1.64e \cdot 17x$)	0	114.8	11.6	4.96	2.74	1.95	-

Note: ¹ Assumes no additional care is required by those participants with ISS=0

FIGURE 2: DAYS OF ADDITIONAL CARE BY INJURY SEVERITY
CURVE OF BEST FIT



ISS (x)	0	1	3	6.5	11.5	25
Additional Care (y) (Questionnaire)	0	1.83	3.28	2.74	22.00	98.00
$y = 1.64e \cdot 17x$	1.64	1.95	2.74	4.96	11.60	114.80

a realistic measure of the value of additional care, which is generally given by a female member of the household. Table 45 summarises these results.

6.2.4 REPAIR OR REPLACEMENT OF DAMAGED PROPERTY

PROPERTY OWNED BY ACCIDENT PARTICIPANTS

Three types of property owned by accident participants are likely to be damaged in a collision:-

- vehicles
- goods carried
- clothing worn

The diversity in range and extent of damage to the goods carried and to clothing render both these types of costs difficult to value. They account for a relatively minor proportion of the total accident costs and so attention has been devoted to calculating the repair and replacement costs for damaged vehicles only.

The 513 vehicles involved in the case study accidents included all types of motor vehicle, pedal cycles and a train. The damaged vehicles varied widely in their preaccident market values (e.g. Mercedes vs. Holden) and in their age and preaccident condition. Consequently there are significantly different repair costs even for the same degree of accident damage.

Not all vehicles are restored to their preaccident state, some are more than fully repaired (to a superior condition), others are under-repaired (which is in effect equivalent to partial 'scrapping' of the vehicle) and in other cases the whole vehicle is scrapped, when repair costs are greater than the expected cost of replacing the vehicle LESS scrap value of the damaged vehicle. These three alternatives were discussed by Troy and Butlin (1971) and they also clarified the situation where partly depreciated damaged parts are replaced with new parts. This does not necessarily constitute an "... over-repair, provided that there is technically no substitute and that the additions of limited new parts do not extent the service life or efficiency of vehicles beyond precollision expectations."

The decision to under-repair a vehicle is usually made by those persons not covered by insurance and yet their decision to partially scrap involves a cost in terms of a lower capital value of the vehicle and this is to be accounted for in the total cost of damage to vehicles.

The information on vehicle damage obtained from the Cost of Accident Questionnaire resulted in a sample too small for conclusive evidence to be drawn on average vehicle damage costs for vary-

ing levels of injury severity. This information was supplemented with other data sources:-

- Police reports (an estimate of the 'value of damage to all vehicles, animals and other property involved' is recorded.)
- In-depth study engineering reports (actual repair costs recorded on several engineering files.)
- In-depth study photographic records (actual damage to each vehicle.)

Each of the four information sources was used to get the best estimate of vehicle damage costs. Wherever possible the information from owners and actual cost records were used but in these cases the price charged by a crash repairer was not necessarily a true resource cost. The resources consumed in repair are represented by the inputs of crash repairers but it is likely the price charged by crash repairers exceeds the marginal cost of the resources actually absorbed in restorative action. It is the resources that could be used in alternative activities (such as improving maintenance levels) that should be measured.

Where actual repair costs were unavailable the photographs of vehicle damage were studied and one of the original In-depth Study researchers made an estimate of the costs required to restore the vehicle to preaccident condition. It was assumed that second-hand parts (equivalent in preaccident condition to the damaged parts) would be used where possible and home labour (incurring an imputed price) would be used for very minor damage. The police estimates were sometimes used to give an order of magnitude of damage costs.

When a vehicle was considered a write-off an estimate of its preaccident market value was determined by reference to a used car price guide for South Australia (March 1976) and, where known, allowance was made for the condition of the vehicle.

The average vehicle damage cost has been calculated for each injury severity category. It should be remembered that many of the injured persons will incur no vehicle damage costs as they do not own the vehicles. Passengers are thus not, in general, responsible for the repair costs to the vehicles. The average costs of vehicle damage per person injured are correspondingly reduced and the reader will notice that there is no regular increase in property damage costs with injury severity. The greater likelihood of pedestrians, pedal cyclists and motorcyclists receiving the most severe injuries can help explain the low damage costs in the ISS=5-8 and 9-14 categories. In the In-depth study 40 per cent of those persons injured with ISS=15+ were car drivers. This percentage was greater than the corresponding percentage of car drivers in every other injury severity category: 34 per cent in ISS=1, 42 per cent in ISS=2-4, 38 per cent in ISS=5-8 and 30 per cent

TABLE 45: AVERAGE COST OF ADDITIONAL CARE BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Cost of Additional Care \$1976	0	2150	252	130	72	51	0
Cost of Additional Care \$1980	0	3169	371	192	106	75	0

TABLE 46: AVERAGE COST OF REPAIR FOR VEHICLE DAMAGE BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Cost of Vehicle Damage \$1976	159	960	500	540	630	385	405
Cost of Vehicle Damage \$1980	231	1394	726	784	915	559	588

TABLE 47: COST OF REPAIR (\$A 1976) FOR DAMAGED VEHICLES BY INJURY SEVERITY
MARKET VALUE VEHICLE

Cost Ratio	ISS						
	Fatal ¹	15+	9-14	5-8	2-4	1	0
<u>Total Cost Repair</u> <u>Total Market Value</u>	-	.944	.880	.743	.606	.566	.323

Note: ¹ In the eight fatal accidents, only five vehicles were damaged. Consequently the sample size was too small to estimate a reasonable value of the costs of repair as a ratio of market value. The fatally injured road users were:- four pedestrians, three motorcyclists, one car driver and one motorcycle pillion passenger.

in ISS=9-14. This explains the relatively high average vehicle damage costs attributed to ISS=15+. Table 46 summarises the results.

In many cases the costs of repair, for the same degree of damage, varied by several hundred dollars. Usually this was due to the varying preaccident condition and varying market values of the vehicles concerned. To take this effect of variation in market value costs into account the total 1976 cost of repair has been divided by the total 1976 market value of vehicles for each ISS category. Table 47 gives the '1976 cost of repair divided by 1976 market value' for all vehicles in each ISS category. In the case where the vehicle was a write-off, the cost of repair exceeds the market value and the ratio is greater than one.

We would expect this measure of vehicle damage cost to approximate more closely the degree of injury. The cost of damage is now measured as a ratio of market value rather than as an absolute figure with no allowance for the variance in market values or the relatively low market values of bicycles and motorcycles.

Table 47 does show this expected close association between the ratio of Cost of Repair : Market Value and injury severity.

PROPERTY OWNED BY OTHERS

Much property belonging to persons not directly involved in the accident may be damaged at the scene of a collision. This cost parameter covers the damage to property owned by local councils, public authorities and by individuals living in close proximity to the accident site.

Utility poles, parking meters, fire plugs, traffic signs and street trees, all of which are publicly owned, and houses, fences and gardens that belong to individuals living near the accident site have been damaged in the case-study accidents - a brief description and estimate of the cost of the damage is given in the police report on every case.

The actual cost of damage has been calculated using information supplied by the public authority responsible for each type of public property. Table 48 summarises the range of cost figures used and the cost information source for the major types of public property damage. In the cases of private houses, fences and gardens being damaged, the police estimates on cost were used and the \$11,000 damage to a house and fence in Accident 119, a single car collision, was the maximum external property damage attributed to any accident. Only 41 of the 304 accidents resulted in external property damage that was assigned a cost.

The 'external' damage costs are assigned to the driver of the vehicle

causing the damage and therefore the costs are associated here with the driver's ISS category. The average value of 'external' damage was calculated for the varying degrees of injury severity and the results were weighted to ensure the questionnaire results were representative of the ISS distribution in the total accident population. Table 49 summarises the results.

The average cost of external property damage is estimated to be \$20 for persons assigned ISS values of 9-14 and 15+. When private vehicle damage costs are considered the costs in the ISS=15+ category are almost twice as high as the costs for those in the ISS=9-14 category. It is suggested that single vehicle accidents are likely to result in higher external property costs per accident (and per injured person) than accidents involving two or more vehicles. This is because single vehicle accidents often involve a collision with some form of external property rather than a collision with another vehicle.

The average costs of external property damage per casualty are similarly \$20 for both the ISS categories 9-14 and 15+, but the vehicle damage costs (Table 46) are almost twice as high in the 15+ injury level than in the 9-14 level. This is probably explained by the difference in the percentage of single vehicle accidents causing injury in each of these categories. In the ISS=15+ category single vehicle accidents accounted for 12.5 per cent of the injuries but in the ISS=9-14 category single vehicle accidents accounted for 30.5 per cent of the injuries.

6.2.5 LEGAL AND COURT COSTS

The third party insurance system in South Australia deems that liability for the injuries incurred in road accidents is dependent on the legal concept, and proof, of fault or negligence. In establishing such proof, legal and court services are consumed and the costs of collisions are significantly increased by the total judicial resources that are absorbed in compensation claims.

The preparation of the liability aspect of a third party insurance claim will involve the legal practitioner in obtaining and presenting a full proof of evidence in relation to the accident from the plaintiff and full statements from all witnesses. Photographs of the collision site and damaged vehicles are often required and in serious cases, especially where liability may be disputed, a detailed plan of the site is prepared. Information from the Police on the proceedings against the defendant or coroner's inquest proceedings are obtained and studied.

In addition to the medical reports from all doctors involved, a full statement from the plaintiff as to his injuries and residual disabilities and their consequent

TABLE 48: 'EXTERNAL' PROPERTY DAMAGE - RANGE AND SOURCE OF ESTIMATES (\$A 1976)

Source of Cost Information	Property Damaged	Estimate of cost - range	Description of Restorative Action
Adelaide City Council	Parking Meters	\$7.50 \$175.00	Repair Full replacement
Electricity Trust of South Australia	Utility Poles	\$120-\$300 \$230-\$850	Repair Full replacement
Highways Department of South Australia	Traffic signs - Stop/Clearway etc	\$50.00	Full replacement (usually required)
Engineering and Water Supply Department	Fire Plug	\$300.00	Full replacement

TABLE 49: AVERAGE EXTERNAL PROPERTY DAMAGE BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
External Property Damage \$1976	10	20	20	10	10	10	10
External Property Damage \$1980	15	29	29	15	15	15	15

economic impact is obtained and may need to be updated. Future medical and hospital expenses will be assessed and claimed, including nursing services rendered gratuitously. These services relate to situations where it is 'reasonably necessary' to provide the service and it would be 'reasonably necessary' to do so even at a cost.

Hospital clinical notes may be obtained under subpoena. The plaintiff's loss in wages (to the date of the trial) after the deduction of income tax is specifically claimed. Allowances must be made for vicissitudes of life, both favourable and unfavourable, and due distinction should be made for the expected career path and promotion potential of the injured person.

In serious cases accident investigators will attend the scene of the accident and they may be called to give expert evidence.

The effects (both physical and emotional) on the members of the plaintiff's family are documented.

In South Australia the third party insurance claimant is entitled to compensation under the following categories:-

1. Hospital and ambulance expenses
2. Medical expenses
3. Legal costs
4. 'Other' costs - additional out-of-pocket expenses
5. Past income loss
6. Future income loss - discounted to present value
7. General damages.

The final award should be at the level sufficient to compensate the plaintiff for the total loss incurred. Each of the above components ideally may be distinguished and a monetary sum identified for each. There may be some rounding of monetary amounts within the components but there cannot be any significant overlapping.

Many third party injury claims are not litigated but are settled directly between the plaintiff (usually with legal advisers) and the defendant's insurers. In this study 208 third party claims were made by defendants in 157 of the 304 accidents. Of the claims made 29.8 per cent did not include any legal costs either from the plaintiff or the insurance company; most of these cases were for relatively small claims (the average award was \$314.00 and the mean median award was \$100).

Legal costs do not generally vary in direct relationship with the degree of injury severity. It is possible to have minor injury cases that legally are quite complicated and critical injury cases that are quite simple and straightforward. Rather than automatically increasing with the severity of an accident legal fees are more closely related to any uncertainty over legality of fault or liability, to the number of witnesses, to the number of Counsel, to the number of expert witnesses, to the amount of medical evidence and to the problems involved in attaining evidence of economic loss.

It is difficult to give reliable cost estimates on a party/party basis or by degree of injury severity. There are many variables that influence the cost and the following comments give some insight to some of the factors that have a general bearing on cost trends.

The judicial resources absorbed and other legal costs tend to be less where liability can readily be determined. In some cases the offending road user is obviously responsible and liability is admitted. In some other cases where liability is agreed, only the damages have to be assessed and that too is less costly.

The costs of solicitors for the plaintiff are higher than those of the solicitor for the defendant. This is because the primary responsibility is on the plaintiff to prove negligence. The nature of the defence will have a significant bearing on the length and costs of the legal proceedings. Possible contributory negligence by the plaintiff is an important influence on the acceptance of liability by the defence.

Contributory negligence on behalf of the victim does not exclude the possibility of legal action but in South Australia the victim's compensation award is reduced in proportion to the extent of contributory negligence, (e.g. with contributory negligence estimated at 25 per cent, the total compensation payment is reduced by 25 per cent).

In this study the legal costs of the defendant are contained in the Section 6.3.1 on Insurance Administration. The legal expenses of the defendant are incorporated in the statistics on 'management expenses'. The legal and court costs of the plaintiff are summarised as

costs per person involved in the road accidents in Table 50. This table does not give the average legal and court cost per claimant, but it presents the average costs by the degree of injury severity incurred by all persons involved in the accidents.

These costs should be interpreted as 'orders of magnitude' and the reliability of such estimates must be qualified again by the many factors (not injury severity alone) that affect the costs incurred.

It is interesting to look at the legal costs as a proportion of the total payout to CTP claimants. In this study of serious accidents the legal costs of the plaintiff represent ten per cent of the total payout.

Atiyah (1973) has estimated a similar proportion, with 10.4 per cent paid to the plaintiff's legal advisers and 8.6 per cent paid to the defendant's legal advisers. Troy and Butlin (1971) have analysed the distribution of payouts from the National Roads and Motorists' Association Insurance Ltd., (NRMA Ltd), between 1962 and 1965. At that time the proportion paid in total legal costs was estimated to be 19 per cent to solicitors and 13.7 per cent to counsel, totalling 32.7 per cent of the total third party payout. Cooke (1954) estimated that in 1952, in N.S.W., 15 per cent of payments were absorbed by legal costs.

Some proportion of the legal costs will not accrue to solicitors and will be used to pay expert witnesses for their advice and time or to fund resources used in any external detailed investigations that may be required.

6.2.6 POLICE INVESTIGATION COSTS

The police attended 284 of the case study accidents. Their duties included traffic supervision at the accident scene, interviewing the active participants and those participants who were injured and the reporting and other procedures associated with accident assessment and investigation.

The police resources that are absorbed in attending to road accidents and the total investigation costs increase with the severity of the accident. To indicate the full range of police duties that can be required in accident investigation a detailed time and motion study for an accident involving two vehicles and one fatality (including a rescue situation) is given in Table 51.

The South Australian Police Department emphasise that this time and motion analysis is based on minimum investigation requirements. The costs of police investigation, summarised in Table 52, are based on time and motion studies for accidents resulting in the various degrees of injury severity and the relevant wage rates per

TABLE 50: AVERAGE LEGAL AND COURT COSTS FOR THE PLAINTIFF BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Legal and Court \$1976	1108	1629	1243	506	163	142	0
Legal and Court \$1980	1545	2272	1734	706	227	198	0

TABLE 52: AVERAGE COST OF POLICE INVESTIGATION BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Police Investigation \$1976	875	292	257	224	165	69	35
Police Investigation \$1980	1264	422	371	324	238	100	51

Source: Derived from information supplied by South Australian Police Department.

hour of two First Class Constables.¹

6.2.7 TOWING COSTS

To properly estimate the resource cost of towing services absorbed in road accidents the distinction between fixed and variable costs of operation must be made. The towing companies provide a service to vehicles that have broken-down as well as vehicles involved in road accidents.

Fixed costs are those costs that are incurred independent of the number of road accidents attended. Such costs will include some operational and administrative overheads, advertising and some personnel costs. Variable costs, including vehicle operating expenses and most personnel costs are affected by the number of road accidents attended. For this study,

information on actual operating costs of towing vehicles was unavailable and the allocation of joint costs was regarded as impracticable. As an alternative the recommended charge for service (provided by the S.A. Automobile Chamber of Commerce Inc.) has been used.

Towing services were required by 281 of the 615 vehicles involved in the accident study and the costs in each case have been allocated to the driver of the vehicle (and related to the degree of injury sustained by the driver) who is assumed to be the owner of the vehicle for the purpose of allocating towing costs.

The costs of towing are related to the type and weight of vehicle and in 1976 there were two major pricing schedules. The first schedule was appropriate for all cars, utilities, station sedans and panel vans and the second schedule covered trucks and special vehicles of all weights. Charges within each schedule varied according to distance travelled. Any towing service over less than 15 kms is subject to a fixed charge and any distance over 15 kms

¹ First Class Constable wage rate 25.11.76
= \$4.86 per hour (used for 1976 costs)
First Class Constable wage rate 25.11.80
= \$7.01 per hour (used for 1980 costs)

TABLE 51: POLICE INVESTIGATION, TIME AND MOTION STUDY - FATAL ACCIDENT INCLUDING A RESCUE SITUATION, TWO VEHICLES, ONE FATALITY¹

Accident Investigation	Number of Hours
Attendance at scene, rescue, assessment, photography, marking, provisional measuring, miscellaneous activity	5
Tow truck - Police removal of vehicles, storage report	4
Advising next of kin and arranging identification of deceased after admission to mortuary	4
Chain of evidence, St. John, Hospital, Mortuary, relative, Police, Coroner's staff, Pathologist	8
Documentation at office, various forms, summary book, advising Communications Centre of details	2
Liaison with Tech. Services re examination of clothing, vehicle components etc. and actual work done	6
Examination of vehicles and reports	6
Interrogation of defendant, arrest, charge, cells, documentation - Information	5
Witnesses - interview, statements at private addresses after location	20
Witnesses Declarations to be signed and witnessed after typing	10
Re-attendance at scene in daylight, photography, measuring	4
Drawing scale plan and compiling report of observations and legend	5
Processing of photographs	3
Miscellaneous typing - PD.83 ² , interrogation, statements, Summary, preparation of file and submission for vetting.	8
	90 x 2 ³
	= 180 hours

Source: South Australian Police Department

Notes: ¹ This does not include Legal Branch Adjudication, Court processing or attendance, nor Coroner's staff activities.

² Police accident report form.

³ Based on employment of two First Class Constables.

TABLE 53: AVERAGE TOWING COSTS BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Towing Costs \$1976	5	10	10	10	10	5	5
Towing Costs \$1980	8	15	15	15	15	8	8

is charged at the fixed rate plus an excess amount per kilometre.

Costs varied quite significantly between 'normal' hours (defined as 7.30 am -5.00 pm Monday to Friday) and 'after' hours (from 5.00 pm Monday to Friday and all Saturday, Sunday and public holidays) and an additional surcharge of \$5.00 was suggested for all work done between midnight and 7.30 am.

The extent of damage to each vehicle was assessed to determine the difficulty of recovery, and the distance of towing from the accident site to the crash repairer or other destination was estimated. The towing costs based on the recommended prices ranged from \$13.00 to \$37.00 with the average cost = \$18.00 per towing service. The average cost of towing per person involved in the accidents was \$5.00 and the average costs per degree of injury severity (of drivers in this specific case) are summarised in Table 53.

6.2.8 FUNERAL COSTS

In studying road accident fatalities our concern is with accidental and premature deaths. The appropriate funeral cost for such deaths is calculated as the average funeral costs in the actual year of death LESS the present value of average funeral costs incurred at the end of the actuarially 'expected' lifetime.

The average cost of funerals in 1976 is derived from information provided by two funeral directors operating in the Adelaide metropolitan area. The costs include the coffin used, removal of the deceased, registration of the death, provision of the hearse and direction of the funeral. The cost of headstones, floral tributes and advertising are not included.

The average funeral costs incurred in 1976 are estimated to be \$650.00 (\$A 1976), but over time the 'value' of 1976 dollars will diminish with the future dollar being of less worth than the current dollar. Consequently the funeral costs

that inevitably would have been incurred at the actuarially calculated date of death would be relatively lower than the 1976 costs.

The calculations used to estimate both the 1976 and the 1980 funeral costs are based on Faigin's methodology as shown in Tables 54 and 55.

6.2.9 MISCELLANEOUS COSTS

The miscellaneous cost parameter covers three relatively minor cost components:-

1. Transport costs incurred by:
 - a. the victim (for outpatient or other medical treatment after hospital discharge)
 - b. family and friends (to visit the victim in hospital or nursing home).
2. Employer costs - restaffing, retraining and reorganisation as a result of temporarily or permanently losing an employee through injury.
3. Traffic congestion costs - at the scene of the accident.

There was not sufficient accurate information to provide reasonable cost estimates for either the second or third components. The 'Cost of Accident' questionnaire has provided some insight into the extent of restaffing, retraining and reorganisation as a result of an employee sustaining injury. This information is included in the analysis of questionnaire results presented in Appendix A.

There is no Australian information on the costs of traffic delays at the accident scene. In most Australian studies the estimates in Faigin (1976) have been used, but these are not considered to be suitable for the conditions in Adelaide. The wide use of expressways, which often come to a complete halt (for several hours) with a crash, are not relevant to South Australia and the volume of traffic in Adelaide is much lower than the American 'rush hour' volumes on which Faigin's calculations are based.

TABLE 54: AVERAGE FUNERAL COSTS \$A 1976

Average funeral cost (South Australia 1976)	:	\$650.00
Median age of fatalities (South Australia March 1976 - March 1977)	:	29 years
Remaining years of life expectancy (Weighted average males and females)	:	Males - 41.9 Females - 47.6
Distribution of fatalities (South Australia March 1976 - March 1977)	:	Males - 83.1% Females - 16.9%
Remaining years - weighted average : 41.9 (0.831) + 47.6 (0.169) = 43 years		
Annual productivity price increase 3% = \$650 x (3.5645) = \$2316.93		
Annual discount rate 6% = \$2316.93 x (0.08163) = \$189.13		
Current cost (1976) LESS Future cost = \$650.00 - \$189.00 = \$461.00		

TABLE 55: AVERAGE FUNERAL COSTS \$A 1980

Average funeral cost (South Australia 1980)	:	\$900.00
Median age fatalities	:	22 years
Remaining years of life expectancy (Weighted average males and females)	:	Males - 48.4 Females - 54.4
Distribution of fatalities (South Australia 1980)	:	Males - 75.8% Females - 24.2%
Remaining years - weighted average : 48.4 (0.758) + 54.4 (0.242) = 50 years		
Annual productivity price increase 3% = \$900 x (4.3839) = \$3945.51		
Annual discount rate 6% = \$3945.51 x (0.05428) = \$214.16		
Current Costs (1980) LESS Future cost = \$900.00 - \$214.00 = \$686.00		

The 'Cost of Accident' questionnaire has been used to provide estimates of the Transport costs experienced by the victim and family and friends. Questions 5 and 6 in Section D of the questionnaire give the type of transport and the number and length of trips made by the injured person and those family members who visited the injured person in hospital or a nursing home.

5. Please write in the type of transport that your family used to visit you in hospital or nursing home or while recovering elsewhere.

	Type of Transport	Total length of Journey for Visit	No. of Visits
Hospital			
Nursing Home			
Other			

6. Please write in the type of transport you used for your visits to outpatients or to the doctors.

	Type of Transport	Total length of Journey for Visit	No. of Visits
Outpatient visits			
Doctors' visits			
Other			

To determine the total cost of the trips made to hospital, outpatients, doctor or other the required information is listed as follows:

- The number of trips made by the injured person. (Table 56 and Figure 3)
- The number of trips made by the family (or relatives). (Table 57 and Figure 4)
- Average length of trip for the injured person. (Table 59)
- Average length of trip for the family. (Table 60)
- Average operating cost of transport mode per kilometre - estimated on the basis of information from the Royal Automobile Association.

The number of trips made by the injured person was estimated from the questionnaire data. The results indicated that the number of attendances at outpatients, at the doctor (or other) increased with the level of injury severity. A curve of best fit was applied to the results to allow for the apparently aberrant result in the ISS=5-8 category. The final result indicated an almost perfect linear relationship between the number of trips and injury severity. (Table 56 and Figure 3)

The number of trips made by the family to the hospital, nursing home (or other) also increased with injury severity. Table 57 presents both the questionnaire results and the results from applying a curve of best fit (Figure 4).

The total number of trips made by both the injured person and the family are shown in Table 58. The questionnaire results and the curve of best fit results

are presented.

Tables 59 and 60 present the average length of the trips made by the injured person (13 kms) and families (16 kms) respectively. The results have been calculated on the basis of questionnaire results. Further information from the questionnaire provides some insight into the use of private versus public transport. The percentage of the total number of trips made by each type of transport is given in Tables 59 and 60.

The average cost of transport for trips made by the injured person is presented in Table 61. It was assumed that the average 'social' cost of transport per kilometre travelled was approximated by the cost for private transport, 14.17 cents per kilometre (March 1977) (Refer Table 61, Note 2). The average cost of transport for trips made by the family is given in Table 62.

6.3 ADMINISTRATIVE COSTS

6.3.1 INSURANCE ADMINISTRATION

The total cost of road accidents depends on the number and severity of accidents and also on the routines and processes undertaken in post-collision restorative action. Consequently the insurance system has a significant influence on the total cost of accidents.

The compulsory third party insurance system (CTP) prevails over the compensation procedure and any inadequacy or inefficiency in the procedures of this insurance system or the comprehensive insurance system tend to increase the total cost of road accidents.

There is no information available on the administration costs of the overall insurance system in South Australia. The Australian Bureau of Statistics (A.B.S.) presents summary information on Selected Items of Expenditure for comprehensive motor vehicle insurance and compulsory third party (motor vehicle) insurance. This information identifies most of the components of total administration costs but there are several relatively small expenses, for example not normally recurring expenses or adjustments or excess levies made to insurers contribution funds, that are not included. The details of the A.B.S. information are presented in Table 63.

The Australian Bureau of Statistics does not request nor present information on the number of insurance claims made in each State. Consequently the administration costs shown in Table 63 cannot be expressed in terms of the cost. Even if this were possible the costs would be understated as only selected items of expenditure have been included.

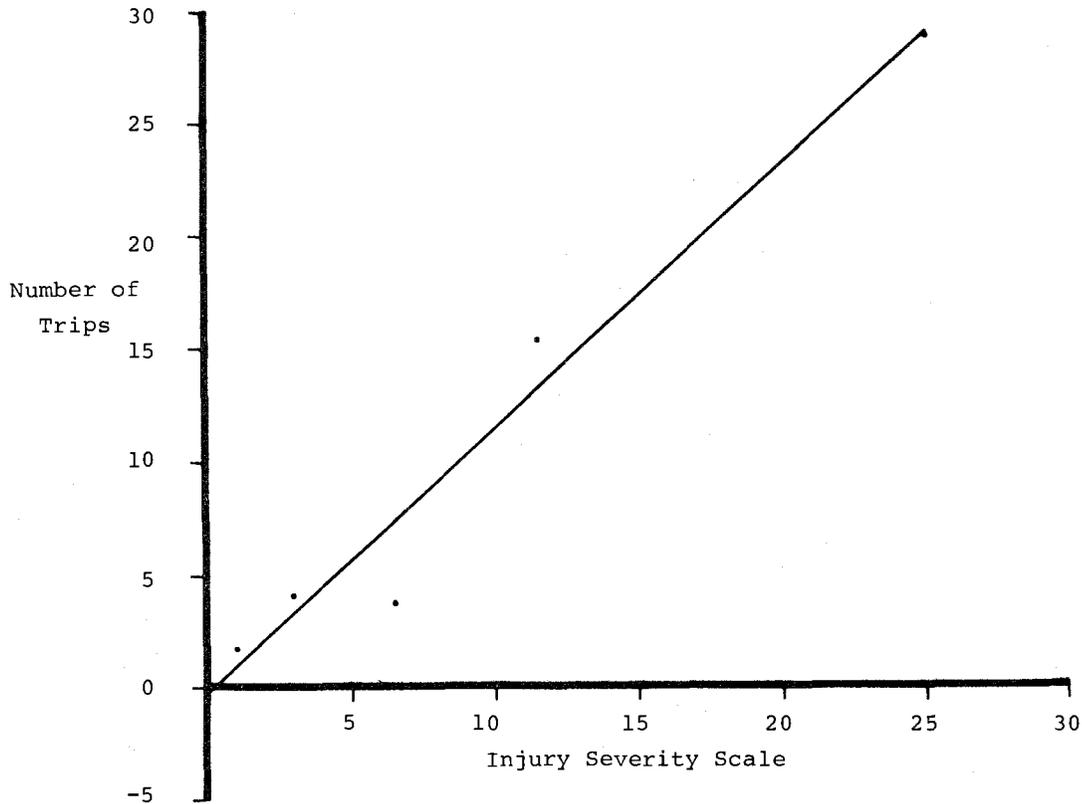
In the absence of Australian

TABLE 56: AVERAGE NUMBER OF TRIPS MADE BY VICTIM TO OUTPATIENTS, DOCTOR OR OTHER¹ (y) BY INJURY SEVERITY

Average Number of Outpatient, Doctor or Other Trips made by Victim	ISS (x)						
	Fatal	15+	9-14	5-8	2-4	1	0
Questionnaire data	0	28.8	15.3	3.6	4.7	1.7	0
Curve of Best Fit (y = 1.161x - .158)	0	28.9	13.2	7.4	3.3	1.0	-

Note: ¹ Assume - No trips are made by those participants with ISS=0

FIGURE 3: NUMBER OF TRIPS MADE BY VICTIM BY INJURY SEVERITY CURVE OF BEST FIT

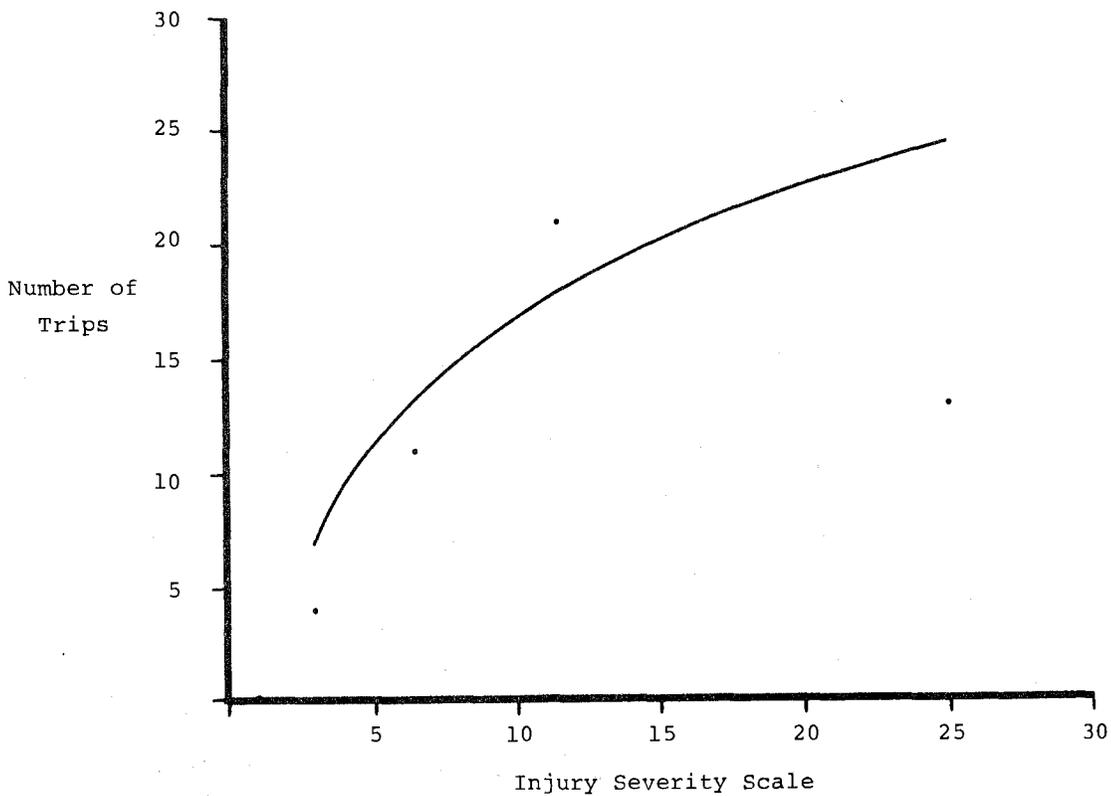


ISS (x)	0	1	3	6.5	11.5	25
Victims' Trips (y) (Questionnaire)	.111	1.72	4.09	3.63	15.33	28.75
y = 1.161 x - .158	-.16	1.00	3.33	7.39	13.20	28.87

TABLE 57: AVERAGE NUMBER OF TRIPS MADE BY FAMILY TO HOSPITAL, NURSING HOME OR OTHER¹ (y) BY INJURY SEVERITY

Average Number of Hospital, Nursing Home or Other Trips made by Family	ISS (x)						
	Fatal	15+	9-14	5-8	2-4	1	0
Questionnaire	0	13.3	21.3	11.2	4.3	0	0
Curve of Best Fit ($y = 8.22\ln x - 2.12$)	0	24.3	18.0	13.3	6.9	-	-

FIGURE 4: NUMBER OF TRIPS MADE BY FAMILY BY INJURY SEVERITY



ISS (x)	0	1	3	6.5	11.5	25
Family Trips (y) Questionnaire	0	0	4.00	11.00	21.00	13.00
$y = 8.22\ln x - 2.12$	-	-	6.91	13.26	17.95	24.34

TABLE 58: AVERAGE NUMBER OF TRIPS MADE BY BOTH VICTIM AND FAMILY BY INJURY SEVERITY

Average Number of Trips made by Victim and Family	ISS (x)						
	Fatal	15+	9-14	5-8	2-4	1	0
Questionnaire data	0	42.1	36.6	14.8	9.0	1.7	0
Curve of Best Fit	0	53.2	31.2	20.7	10.2	1.0	0

TABLE 59: AVERAGE LENGTH OF TRIPS MADE AND TYPE OF TRANSPORT USED - BY VICTIM¹

Type of Transport	No. of Respondents	Total Number of Trips	% of Total Number of Trips
Private Transport	44	523	78.5%
Public Transport	17	143	21.5%

Total length of trip - 49 respondents		= 615 kms	
Average length of (2-way) trip		= $\frac{615 \text{ kms}}{49}$	= 13 kms

TABLE 60: AVERAGE LENGTH OF TRIPS MADE AND TYPE OF TRANSPORT USED - BY FAMILIES¹

Type of Transport	No. of Respondents	Total Number of Trips	% of Total Number of Trips
Private Transport	35	663	86.7%
Public Transport	8	102	13.3%

Total length of trip - 37 respondents		= 589 kms	
Average length of (2-way) trip		= $\frac{589 \text{ kms}}{37}$	= 16 kms

¹ Source: Cost of Accident Questionnaire

TABLE 61: AVERAGE COST OF TRANSPORT FOR TRIPS MADE BY VICTIM TO OUTPATIENTS,
DOCTOR OR OTHER^{1,2} BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Cost of Victim's Transport \$1976	0	53	24	14	6	2	0
Cost of Victim's Transport \$1980	0	81	37	21	9	3	0

Notes: ¹ Calculated on number of visits estimated from Curve of Best Fit (Table 56), assuming average distance of 13 kms travelled per visit (Table 59)
² Average 'social' cost for private transport per kilometer = 14.17¢/km
Calculated by the Royal Automobile Association, March 1977 for Holden Kingswood

TABLE 62: AVERAGE COST OF TRANSPORT FOR TRIPS MADE BY FAMILY TO HOSPITAL, NURSING HOME
OR OTHER^{1,2} BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Cost of Family Transport \$1976	0	55	41	30	16	0	0
Cost of Family Transport \$1980	0	84	62	46	24	0	0

Notes: ¹ Calculated on number of visits estimated from Curve of Best Fit (Table 57), assuming average distance of 16 kms travelled per visit (Table 60).
² Average 'social' cost for private transport per kilometer = 14.17¢/km
Calculated by the Royal Automobile Association, March 1977 for Holden Kingswood.

TABLE 63: SELECTED ITEMS OF INSURANCE EXPENDITURE, SOUTH AUSTRALIA 1976-77

Expenditure	Motor Vehicle Comprehensive (\$A)	Compulsory third party Motor Vehicle (\$A)
Contributions to fire brigades (etc)	925,000	-
Commission and agents' charges	4,435,000	3,000
Expenses of Management ¹	10,875,000	1,378,000
Taxation ²	949,000	210,000
Other underwriting expenses	84,000	-
Total	17,267,000	1,591,000

Notes: Source : Australian Bureau of Statistics : General Insurance Australia 1976-1977 (5620.0)

¹ Expenses of the Australian control office of each organisation are allocated as management expenses proportionately between the States on the basis of premiums receivable in each State.

² Includes payroll tax, licence fees etc. Excludes stamp duty and income tax.

information some indication of the total costs of insurance is found in the literature on overseas experience. It appears that the liability insurance system is expensive to operate. Atiyah (1975) states... "... precise information is unobtainable, but all the evidence suggests that for every pound paid in insurance premiums about 40 pence is absorbed by the general administrative costs of the system..."

Ison (1967) has estimated that commission, administrative costs and payment to reserves and profits absorb 40.4 per cent of liability insurance premiums. Information from Lees and Doherty (1973) suggests that a similar percentage, 42.5 per cent, of premiums is absorbed in total administration costs.

The costs of the comprehensive and compulsory third party insurance systems primarily consist of commission charges (mainly for comprehensive insurance), taxation and management expenses. The components included in management expenses are salaries, legal expenses, travel expenses, directors' and auditors' fees, office rent, hire and maintenance of machinery, contributions to staff superannuation funds, advertising, printing and stationery, post and telephone, depreciation expenses and 'other' expenses.

Legal costs (as discussed in Section 6.2.5) are generally incurred in third party claims.

In many situations the legal procedures involved in determining fault in the accident and the assessment of quantum and the consequences of the accident (medical reports etc.) are

duplicated as legal representatives for both the plaintiff and the defendant make similar enquiries.

The commission and agents costs primarily relate to comprehensive motor vehicle insurance where there is competition within the market. On the other hand, the State Government Insurance Commission (S.G.I.C.) has handled all the third party compensation cases since July 1975. In 1976 S.G.I.C. was the only insurance company involved with the third party insurance claims arising from the case-study accidents.

The liability insurance system considered as a whole conceals some quite significant differences between the costs of compulsory third party insurance and the costs of property damage insurance. On the basis of Australian information, Atiyah (1973) states ... "... the total cost of property damage insurance is about 50% higher than the total cost of personal injury insurance, despite the fact that the average claims cost for personal injury ... is about ten times higher than the average cost for property damage ...".

Atiyah estimated that compulsory third party insurance was able to operate on a very low expense ratio, generally less than five per cent. For non-compulsory third party (non-CTP) business the expense ratio was between 20 and 25 per cent. The greater costs of comprehensive insurance result from the complicated insurance premium rating system and the greater number of insurance claims made annually.

On the basis of C.T.P. administrat-

ion cost information supplied by S.G.I.C. the administration expenses of C.T.P. in 1976 in South Australia have been estimated at 4.2 per cent of total premium income. The comparable percentages for 1977/78, 1978/79 and 1979/80 are 4.3 per cent, 4.6 per cent and 3.1 per cent respectively. The information could not be used to calculate the expense ratio for comprehensive insurance as S.G.I.C. is not the sole insurer for this type of risk.

The overall administration costs as a percentage of premiums paid, appear to be significantly less in Australia than the literature indicates for the U.K. or the U.S.A.

In this study our concern is with the 'incremental administration costs' that are incurred per claim as a result of actual accidents and not with the overall costs of administration which include the writing of policies for all road users. The incremental costs of compulsory third party insurance administration are more likely to include legal costs and detailed requirements for compensation than are comprehensive cases. Correspondingly the incremental costs associated with C.T.P. claims will be greater than those incremental costs involved with comprehensive insurance claims.

The average administration costs have been derived from information supplied by the South Australian State Government Insurance Commission.

Information was requested on the following costs:-

1. the administrative expenses involved with comprehensive insurance administration of actual accidents.
2. the administrative expenses involved with compulsory third party insurance cases.

There was some difficulty in giving precise estimates for "Motor Comprehensive" activities as that Department fulfils a total role encompassing both claims and underwriting but the most accurate available estimates for the year 1976/77 were calculated on the basis of modified actual costs.

On the basis of the total average administration costs supplied by S.G.I.C., an allocation has been made according to the degree of injury severity, and despite the lack of detailed administrative cost information for specific injury levels these results are considered to be reasonable (Table 64).

There are some obvious problems with the institutional arrangements of the Australian insurance system and analysis of these problems highlights the scope for reducing the insurance costs associated with road accidents. The problems manifest themselves in terms of lengthy delays in settlement and inequality of assessment between minor and serious cases - each of these problems and their conse-

quences have a similar effect on the cost of road accidents.

Of the 208 third party claims made in this study, 30 remain outstanding - a minimum of four years after the accident.

Delays in settlement are experienced by all insurance companies for several reasons. Many claimants (on the advice of their lawyers) are unwilling to press for an early settlement because any delayed injury symptoms would have been omitted from the assessment of residual disability and so they would not obtain reasonable compensation. The cases in this study indicate that it is not necessarily litigation that prevents prompt settlement but rather the bargaining processes that are involved in most cases. Whatever the cause, there are several important consequences of the delays that serve to increase the cost of road accidents.

In order to pay the 'unsettled claims' the insurance companies must put aside sufficient funds to cover their future payments which will include inflationary components that increase wages, medical and legal costs. The 'outstanding provisions' are usually invested and thus provide a substantial investment income which can be used to offset the higher costs of the delayed settlements. In the past this investment income has enabled insurance companies to meet the higher settlements (of delayed claims) without raising current premiums but the recent monetary pressures with the return on investment increasing at a lesser rate than inflation has required some significant premium increases.

The third party compensation awards have increased significantly in the past five years and the recent developments in the assessment of damages signify further substantial increases. In 1975 gratuitous care was recognised as a legitimate, compensable expense. The more recent changes with regard to the appropriate discount rates to be applied to lump sum awards will have a marked impact on increasing total awards. In order to take account of the effects of inflation on lump sum payouts, it is argued that the money amount compensating for loss of future earnings should not be discounted at all, or at most, discounted by no more than two per cent. This situation will result in significantly greater awards.

In this study there appear to be some quite marked divergences between the injuries reported to the insurance company and the injuries recorded by the medical officers working on the In-depth Study. These divergences appear to confirm the belief that the compensation system tends to encourage individuals to exaggerate their injuries or residual disabilities and to claim excessive medical and hospital treatment in an attempt to justify high estimates of future and past foregone income. This accident or compensation-neurosis could be reduced with efficient settlement of claims, and evidence by Miller (1961) and Ellard (1970) suggest

TABLE 64: AVERAGE INSURANCE ADMINISTRATION COSTS BY INJURY SEVERITY
(\$A 1976) AND (\$A 1980)

Cost Parameter	ISS						
	Fatal	15+	9-14	5-8	2-4	1	0
Comprehensive Insurance ¹	39	39	39	39	39	39	39
Third Party Insurance	310	370	310	310	310	250	
Total \$1976	349	409	349	349	349	289	39
Total \$1980	464	544	464	464	464	384	54

Note: ¹ Calculations based on an average of 1.9 persons per vehicle.

that this may be the case as some forms of genuine neurosis actually prohibit an individual returning to work until his claim is settled. However two Australian papers by Cole (1970) and Balla (1970) state that the neurosis is unlikely to be eliminated simply.

Perhaps the most disturbing feature of the third party compensation settlements was the divergence in total settlement for injuries of similar severity, and also the disparity in treatment between small and serious claims. Those claimants employing legal advice will usually receive full (if not greater than full) compensation for their injuries. In making this rather generalised statement I add that it holds particularly for those injuries where medical and hospital costs are not very high but the potential for recurrent pain or longer term effects is recognised. In these cases, legal advice and representation is seen to be a significant advantage and in several cases the award for what are considered to be almost identical injuries varies by 100 per cent.

This study shows that the average 'outstanding provision' made for unsettled claims is \$21,617 whereas the average value of the already settled claims was \$6406. This serves to confirm the well-established and not unexpected observation that small claims are settled faster than large claims (Atiyah (1973); Troy and Butlin (1971)). A further body of overseas literature suggests that those individuals with relatively small economic losses recover a larger proportion of their total losses than those individuals with large economic losses but this could not be substantiated from the summary figures available for this study.

6.4 PAIN AND SUFFERING

The pain and suffering experienced by those persons injured in road accidents is usually regarded as an intangible cost parameter. The lack of adequate sources of information and the conceptual problems involved in expressing pain and suffering, personal hardship and grief, as dollar amounts, generally render valuation, at best, difficult and at worst impossible.

Nevertheless, several authors have tried to value the subjective nature of pain and suffering: Dawson (1967) and Little (1968) were the first to introduce pain and suffering as cost parameters. Typically pain and suffering are estimated from court awards and Troy and Butlin (1971) deducted current resource costs (medical, legal and vehicle etc.) from total court awards to find the residual value and used this as an estimate of pain and suffering. Joksch (1975) gave a range from \$70.00 to \$13,600.00 (\$US 1975) for the non-economic loss involved in road accident injuries - these estimates were also based on court awards.

There is little doubt over the justification for including this parameter as a significant road accident cost. Pain and suffering is recognised as a compensable loss and in this study, rather than have the parameter unvalued, the third party compensation awards (relating to the case-study accidents) have been analysed and the average amount of General Damages is calculated for each level of injury severity.

General Damages are those damages deemed to be 'not assessable' with mathematical accuracy. They may be consider-

ed under the following three headings:

- a. Pain and suffering (past and future)
- b. Loss of amenities or enjoyment in life (past and future)
- c. Loss of expectation of life.

In this study the cost parameter of 'Pain and Suffering' incorporates each of these General Damage components. It is in effect the value of compensation for any residual disability, disfigurement physical pain and any worry, anxiety and frustration consequent upon the injury.

The damages for the loss of amenities and enjoyment of life are awarded both with regard for the actual loss suffered and the loss as perceived by the injured person. Thus in the situation where the plaintiff is in a coma or has severely reduced mental capabilities the award will be relatively small because the plaintiff does not fully comprehend the loss incurred. Loss of amenities of life include blindness, deafness, loss of libido and scarring. They cause no pain but they adversely affect the injured person's happiness.

The damages for the loss of expectation of life are awarded with regard for the loss of prospective pleasure over the period by which the injured person's life is expected to be (or has been) shortened.

There are several important criticisms of the use of court awards as a basis for valuing. Faigin (1976) states court awards can be used as a basis for measuring the loss from pain and suffering only if the following three conditions are satisfied:

- "...1. that a jury makes a determination as a proxy for society as a whole,
- 2. that an award for pain and suffering is based conceptually on the extent of pain and suffering and is not a measure of guilt or culpability of the defendant, and
- 3. that a large enough sample of cases would be taken to eliminate any potential judicial bias."

Certainly the problems associated with the overall assessment of third party compensation awards (refer Section 6.3.1) will apply to the valuation of pain and suffering in the basis of such awards.

For example any lack in objectivity in awarding damages will have a significant biasing influence on the measurement of pain and suffering losses. Those persons receiving high awards solely as a result of clever legal advice and representation will be 'over-compensated' for their actual pain and suffering. In other cases the award for pain and suffering is reduced in proportion to the degree of contributory negligence and as such the award reflects the degree of guilt and does not satisfy the second of Faigin's conditions. In this study the compensation amounts awarded BEFORE contributory negligence adjustments have been used and the degree of guilt does not affect the final estimates of loss.

Troy and Butlin (1971) detail another difficulty in trying to obtain objective measures of pain and suffering. Some individuals may minimize their use of hospital and medical care in an attempt to maximize their own financial reward from the compensation pay-out. Other individuals will maximize their use of hospital and medical care in order to fully recover as quickly as possible and their financial reward for pain, suffering and residual disability is likely to be significantly less than the person who is 'harbouring' a degree of residual pain or who exaggerates the nature of the injury and the healing process.

Analysis of verdicts given for pain and suffering and loss of amenities generally shows that the awards are fairly moderate amounts of \$1,500 to \$10,000 (\$1976). Serious, more lasting injuries range about the \$13,000 level (\$1976). The highest amount of general damages in the case study accidents was awarded to a 21 year-old car passenger involved in a single vehicle collision (Accident 096). General damages of \$50,000 (\$1980) were awarded to 'compensate' his injuries which included multiple and severe facial fractures, loss of the sight in his right eye, a fractured spine and internal injuries to the bowel and bladder. He suffers some permanent memory loss and permanent facial disfigurement. Several other serious injury cases remain outstanding and the general damage awards in those cases are also expected to be high.

The degree of confidence we can place in the following estimates of pain and suffering must be qualified by the problems outlined above. The estimates shown in Table 65 are presented as orders of magnitude of the average level of pain and suffering in each level of injury severity rather than as exact estimates.

TABLE 65: AVERAGE PAIN AND SUFFERING LOSSES BY INJURY SEVERITY (\$A 1976) AND (\$A 1980)

Cost Parameter		ISS						
		Fatal	15+	9-14	5-8	2-4	1	0
Pain and Suffering	\$1976	3,527	12,867	5,397	2,801	1,064	727	0
Pain and Suffering	\$1980	5,171	18,866	7,177	4,107	1,560	1,065	0

7. RESULTS - FURTHER ROAD ACCIDENT COST ANALYSIS

The total cost estimates of serious road accidents in the Adelaide Metropolitan Area and in South Australia must surely underline the magnitude of the traffic accident problem and stimulate the recognition of the need for continuing and improved road accident countermeasures. However, aggregate cost estimates provide little guidance for the direction of such countermeasures because the areas of maximum cost are not identified.

This Section presents cost distributions by accident type and by the primary errors of the active participants (based on the assessment of a member of the In-depth Study team). Thus areas of significant cost minimisation potential are identified.

7.1 COST PARAMETERS BY ACCIDENT TYPE

Costs have been allocated to the 'accident types' on the basis of the number of victims in each ISS category for each type of accident. It is assumed that the average cost of each level of injury severity (shown in Tables 2 and 3) is applied to each injured person, (e.g. car vs. car collisions: there were seven persons injured with ISS=15+, $7 \times \$205,553 = \$1,438,871$ in 1980 dollars. Refer Column 2 in Table 67).

Tables 66 and 67 relate to the costs of the 304 accidents in the In-depth study sample and give the total and the average cost per accident by eleven categories of 'accident type' in 1976 dollars and 1980 dollars respectively. On the basis of this cost distribution the same proportions of total cost in the Adelaide Inner Metropolitan Area have been allocated to the various accident types - see Table 68. The most common type of accident was the car vs. car (104 accidents) followed by single car accidents (46), motorcycle vs. vehicle (43) and pedestrian vs. vehicle (40 accidents). These four categories account for 76.6 per cent of the total sample.

The nature of the classifications of 'accident type' indicate the number of vehicles involved in each collision except in the case of 'car vs. multi-vehicle' and 'miscellaneous' accidents but the frequency of collisions is basically a clumsy measure of the damage caused by different accident types because there is no insight into the cost consequences of each type of collision. The average cost estimates per accident type are more informative and these are shown in the final column in Tables 66 and 67.

The highest average cost per accident is \$123,048 (\$85,331 (all 1976 dollar amounts are written in brackets after 1980 estimates) relating to miscellaneous accidents. This average has been biased upward by the inclusion of Accident 264, a fatality accident involving an 18 year-old male car driver in a collision with a train. As there are only four accidents in the miscellaneous category the very high costs of the fatality victim's foregone income have given an exaggerated average cost result which is unlikely to be maintained in a larger sample of miscellaneous accidents.

The most expensive collisions are those involving fatalities, four fatalities resulted from pedestrian vs. vehicle accidents and four motorcyclists were killed in single motorcycle accidents. The relative lack of crash protection for motorcyclists, cyclists and pedestrians and their consequent high risk of injury is reflected in the high average costs of accidents involving these road-users. The average cost for single motorcycle accidents is \$91,871 (\$63,645), for bicycle vs. vehicle accidents \$85,426 (\$59,308) and for pedestrian vs. vehicle accidents \$82,873 (\$57,474). After the miscellaneous accidents, these collision-types incur the highest average costs.

It is reasonable to assume that in bicycle vs. vehicle and pedestrian vs. vehicle collisions only one person (the cyclist, the pedestrian, or the motorcyclist in single motorcycle accidents) will be severely injured and the average accident costs relating to these three accident types are primarily related to the significant level of personal injury, rather than to the property damage incurred.

The average costs for motorcycle vs. vehicle collisions - \$40,182 (\$27,986) are lower than expected. The low level of crash protection afforded motorcyclists in collisions with vehicles could be expected to result in high levels of injury severity and high personal injury costs. The sample of 43 such accidents involved only two persons assigned ISS=15+ and 12 persons assigned ISS=9-14. It would be interesting to see how these injury rates changed with a larger sample and the inevitable inclusion of fatalities in this accident type.

The accidents involving cars only (car vs. car, car vs. multi-vehicle and single car collisions) cover a wide spectrum of accidents, varying significantly in the severity of the resultant injuries. Such collisions generally have a relatively high proportion of costs attributed to property damage as the

TABLE 66: TOTAL AND AVERAGE COSTS OF CASE-STUDY ACCIDENTS BY ACCIDENT TYPE¹ (\$A 1975)

Accident Type	ISS							Total Cost	No. of Accidents	Average Cost per Accident
	Fatal	15+	9-14	5-8	2-4	1	0			
Car vs. Car	0	997,003	620,510	229,272	165,519	213,440	90,695	2,316,439	104	22,273
Motorcycle vs. Vehicle	0	284,858	744,612	67,104	31,230	36,800	38,800	1,203,404	43	27,986
Pedestrian vs. Vehicle	848,348	712,145	620,510	44,736	31,230	12,880	29,100	2,298,949	40	57,474
Pedal cycle vs. Vehicle	0	712,145	248,204	16,776	12,492	5,520	13,095	1,008,232	17	59,308
Truck/Bus vs. Vehicle	0	142,429	0	16,776	12,492	4,600	10,185	227,882	14	16,277
Car vs. Multi-Vehicle	0	142,429	186,153	5,592	6,246	18,400	19,400	378,220	11	34,384
Single Car	0	427,287	744,612	72,696	59,337	68,080	16,490	1,388,502	46	30,185
Single Truck	0	0	0	0	3,123	0	0	3,123	1	3,123
Single Motorcycle	848,348	0	310,255	33,552	6,246	5,520	5,335	1,209,256	19	63,645
Single Pedal cycle	0	0	62,051	5,592	0	5,520	970	74,133	5	14,826
Miscellaneous	212,087	0	124,102	0	0	3,680	1,455	341,324	4	85,331
Total Cost	1,908,783	3,418,296	3,661,009	492,096	327,915	415,840	225,525	10,449,464	304	34,373

Note: ¹ Based on In-depth Study Sample of 304 accidents only.

TABLE 67: TOTAL AND AVERAGE COSTS OF CASE-STUDY ACCIDENTS BY ACCIDENT TYPE¹ (\$A 1980)

Accident Type	ISS							Total Cost	No. of Accidents	Average Cost per Accident
	Fatal	15+	9-14	5-8	2-4	1	0			
Car vs. Car	0	1,438,871	888,150	328,697	238,235	304,964	133,705	3,332,622	104	32,044
Motorcycle vs. Vehicle	0	411,106	1,065,780	96,204	44,950	52,580	57,200	1,727,820	43	40,182
Pedestrian vs. Vehicle	1,228,632	1,027,765	888,150	64,136	44,950	18,403	42,900	3,314,936	40	82,873
Pedal cycle vs. Vehicle	0	1,027,765	355,260	24,051	17,980	7,887	19,305	1,452,248	17	85,426
Truck/Bus vs. Vehicle	0	205,553	0	24,051	17,980	65,725	15,015	328,324	14	23,452
Car vs. Multi-Vehicle	0	205,553	266,445	8,017	8,990	26,290	28,600	543,895	11	49,445
Single Car	0	616,659	1,065,780	104,221	85,405	97,273	24,310	1,993,648	46	43,340
Single Truck	0	0	0	0	4,495	0	0	4,495	1	4,495
Single Motorcycle	1,228,632	0	444,075	48,102	8,990	7,887	7,865	1,745,551	19	91,871
Single Pedal cycle	0	0	88,815	8,017	0	7,887	1,430	106,149	5	21,230
Miscellaneous	307,158	0	177,630	0	0	5,258	2,145	492,191	4	123,048
Total Cost	2,764,422	4,933,272	5,240,085	705,496	471,975	594,154	332,475	15,041,879	304	49,480

Note: ¹ Based on In-depth Study Sample of 304 accidents only.

potential for repair costs is greater in this population of vehicles with high capital values than in a population of pedal cycles or motorcycles. The average cost per car vs. car collision is \$32,044 (\$22,273) and the higher average cost for car vs. multi-vehicle collisions of \$49,445 (\$34,384) is simply explained by the greater number of vehicles and persons involved per accident.

Average costs for single car collisions were estimated to be \$43,340 (\$30,185). These costs are higher than the average costs of two car accidents. This is because in Adelaide the single vehicle accidents are very often collisions with utility poles or trees or parked cars, and these accidents are particularly likely to result in severe injuries and extensive damage to the car.

The lowest average cost per accident was estimated for a single truck accident, \$4,495 (\$3,123). It should be noted that this average was based on only one accident.

The share of different accident types in total costs (Inner Adelaide Metropolitan Area) is shown in Table 68. Column 4 shows that the greatest contribution to total cost was made by car vs. car and pedestrian vs. vehicle accidents, accounting for 22.16 per cent and 22.04 per cent of total costs respectively.

Those accident types that accounted for a share in the total cost that was significantly greater than their share in the number of accidents were pedestrian vs. vehicle, pedal cycle vs. vehicle, single motorcycle and miscellaneous accidents. The high average cost of these accident types was primarily due to the high average severity of injury and to the correspondingly high hospital and medical care and 'income foregone' cost components.

Car vs. car accidents made the greatest contribution to total costs. They were the highest frequency accidents but their cost per accident was less than the average for all accidents. This is a result of the less severe injury expected in such collisions. Motorcycle vs. vehicle, truck/bus vs. vehicle, car vs. multi-vehicle, single car, single truck and single pedal cycle accidents also had relatively low average costs.

7.2 COST PARAMETERS BY PRIMARY ERROR OF ACTIVE PARTICIPANT

Tables 69 and 70 relate to the costs of the 304 sampled accidents in 1976 and 1980 dollars respectively. They present the total costs of accidents by the categories of active participant primary error and also the average cost per active participant primary error. These Tables give some insight into the cost distribution by errors that are related to accident causation.

Active participants as noted earlier are defined to include all those persons in control of a vehicle (car drivers, motorcyclists, pedal cyclists and commercial vehicle drivers) and pedestrians. The information on primary error is obtained from the results of the In-depth Study. (A member of the investigating team recorded his opinion on the primary error made by each active participant in each accident.)

In many cases an active participant was seen not to have contributed to the causation of the accident and in these cases their costs have been assigned to the active participant who did commit an error in the accident. The costs associated with unoccupied (but damaged) vehicles have been assigned to the active participant in the striking vehicle.

The previous reports on the In-depth Study have discussed the role of alcohol, inexperience, inattention and carelessness, and speed in road accidents. These risk factors are important, as is emphasised by their high average cost per active participant error.

Alcohol intoxication is recognised as a major factor in the accidents. One or more of the active participants was found to have a blood alcohol concentration (B.A.C.) above 0.08 in over 24 per cent of the accidents. In single vehicle accidents, at least 50 per cent of the drivers or riders were above 0.08 and as these accidents usually involved collisions with fixed objects (e.g. a tree or a pole), the resulting injuries were severe. The average cost per active participant primary error of alcohol intoxication was the highest of all of those estimated, \$82,926 (\$57,472). Motorcyclists were the group with the highest percentage of alcohol intoxication. In one case, the failure of an intoxicated motorcycle rider to fasten the chin strap of his helmet resulted in him sustaining a fatal head injury. Drugs other than alcohol did not appear to be a serious problem, but the difficulty in testing for such drugs must be allowed for.

Lack of experience was most evident with pedal cyclists and child pedestrians and their involvement in accidents often resulted from impulsive behaviour. The high injury levels associated with pedestrian and bicycle collisions help to explain the relatively high average cost per active participant error assigned to inexperience, \$80,921 (\$56,097).

The primary error of excessive speed was assigned to the active participants who were travelling above the legal speed limit. Those active participants who were travelling below the legal speed limit but at a speed which was considered to be excessive in the circumstances have not been included in this category.

The high average costs associated with a primary error of excessive speed \$33,146 (\$23,051) are explained in part by the greater likelihood of severe injury with greater speed. Seven per cent of the

TABLE 68: DISTRIBUTION OF SERIOUS ROAD ACCIDENT COSTS BY TYPE OF ROAD ACCIDENT¹
 - ADELAIDE INNER METROPOLITAN AREA, MARCH 1976-MARCH 1977(\$A 1980)

Accident Type	Total Costs		Total Costs Inner Adelaide Metropolitan Area
	304 accident sample	% Total Cost	
Car vs. Car	3,332,622	22.16	41,657,775
Motorcycle vs. Vehicle	1,727,820	11.49	21,597,750
Pedestrian vs. Vehicle	3,314,936	22.04	41,436,700
Pedal cycle vs. Vehicle	1,452,248	9.65	18,153,100
Truck/Bus vs. Vehicle	328,324	2.18	4,104,050
Car vs. Multi-Vehicle	543,895	3.62	6,798,688
Single car	1,993,648	13.25	24,920,600
Single truck	4,495	0.03	56,188
Single motorcycle	1,745,551	11.60	21,819,387
Single pedal cycle	106,149	0.71	1,326,863
Miscellaneous	492,191	3.27	6,152,388
Total	15,041,879	100.00	188,023,450²

Notes: ¹ Cost distribution has not been calculated for all South Australian serious road accidents as the proportions of the different types of accidents in rural areas is likely to be significantly different from the proportions in the city and metropolitan areas.

² Rounding error.

drivers and motorcyclists were travelling above the legal limit and in about one third of the collisions at sign controlled intersections there was some evidence that the vehicle on the through road was exceeding the speed limit. At uncontrolled four-way intersections, there was evidence that nearly all the drivers (for whom a speed estimate was available) were travelling at an excessive speed, even though this was usually less than the 60 km/h speed limit.

The errors of inattention and carelessness and failure to observe traffic rules resulted in average costs per active participant of \$38,743 (\$26,915) and \$28,648 (\$19,990) respectively.

It would be wrong to expect road accidents or their associated costs to be eliminated by concentrating solely on the primary errors of alcohol, inexperience, inattention or excessive speed. However by identifying these risk factors as being among the most costly risk factors more attention can justifiably be directed towards the development of countermeasures in these areas.

The share of different primary errors in total cost is summarised in Table 71.

The greatest contribution to total costs was attributed to those active participants who were inattentive or careless. This error accounts for 38.6 per cent of the total costs. The second most costly error was 'inadequate response' which accounted for 24.6 per cent of the total costs. This error includes travelling too close to another vehicle to respond properly, response on the basis of inadequate information (e.g. failure to accommodate to a visual restriction), failure to respond to traffic controls and failure to respond appropriately in an emergency situation.

The errors of active participants that accounted for a share in the total cost that was significantly greater than their share in the total number of errors were 'alcohol and drugs', 'lack of experience' and 'inattention and carelessness'. Each of these errors has a cost greater than average. This is again the result of the higher average levels of injury severity expected from these accidents.

The lesser degrees of injury severity expected from the other categories of primary error result in relatively lower average contributions to the total cost.

TABLE 69: TOTAL AND AVERAGE COSTS OF CASE-STUDY ACCIDENTS BY ACTIVE PARTICIPANT PRIMARY ERROR¹ (\$A 1976)

Primary Error - Active Participant	ISS							Total Cost	Number of Active Participants	Average Cost per Active Participant Primary Error
	Fatal	15+	9-14	5-8	2-4	1	0			
Speed	0	284,858	248,204	39,144	9,369	25,760	15,035	622,370	27	23,051
Inadequate response	0	854,574	1,241,020	150,984	103,059	150,880	78,570	2,579,087	149	17,309
Lack of experience	424,174	284,858	186,153	50,328	24,984	27,600	11,640	1,009,737	18	56,097
Inattention and carelessness	636,261	1,424,290	1,427,173	178,944	131,166	145,360	94,090	4,037,284	150	26,915
Stress, fatigue and emotion	0	0	0	16,776	3,123	0	485	20,384	5	4,077
Alcohol or drugs	848,348	569,716	372,306	33,552	24,984	33,120	14,550	1,896,576	33	57,472
Medical condition	0	0	62,051	0	9,369	11,040	2,425	84,885	5	16,977
Failure to observe traffic rules	0	0	124,102	5,592	12,492	12,880	4,850	159,916	8	19,990
Other	0	0	0	16,776	6,246	5,520	970	29,512	3	9,837
Defective vehicle	0	0	0	0	0	1,840	2,910	4,750	1	4,750
Attempted suicide	0	0	0	0	3,123	1,840	0	4,963	2	2,482
Total Cost	1,908,783	3,418,296	3,661,009	492,096	327,915	415,840	225,525	10,449,464	401	26,059

Notes: ¹ Based on In-depth Study sample of 304 accidents only.

Active participant is defined to include the participants in control of a vehicle or pedestrians.

TABLE 70: TOTAL AND AVERAGE COSTS OF CASE-STUDY ACCIDENTS BY ACTIVE PARTICIPANT PRIMARY ERROR¹ (\$A 1980)

Primary Error - Active Participant	ISS							Total Cost	Number of Active Participants	Average Cost per active Participant Primary Error
	Fatal	15+	9-14	5-8	2-4	1	0			
Speed	0	411,106	355,260	56,119	13,485	36,806	22,165	894,941	27	33,146
Inadequate response	0	1,233,318	1,776,300	216,459	148,335	215,578	115,830	3,705,820	149	24,871
Lack of experience	614,316	411,106	266,445	72,153	35,960	39,435	17,160	1,456,575	18	80,921
Inattention and carelessness	921,474	2,055,530	2,042,745	256,544	188,790	207,691	138,710	5,811,484	150	38,743
Stress, fatigue and emotion	0	0	0	24,051	4,495	0	715	29,261	5	5,852
Alcohol or drugs	1,228,632	822,212	532,890	48,102	35,960	47,322	21,450	2,736,568	33	82,926
Medical condition	0	0	88,815	0	13,485	15,774	3,575	121,649	5	24,330
Failure to observe traffic rules	0	0	177,630	8,017	17,980	18,403	7,150	229,180	8	28,648
Other	0	0	0	24,051	8,990	7,887	1,430	42,358	3	14,119
Defective vehicle	0	0	0	0	0	2,629	4,290	6,919	1	6,919
Attempted suicide	0	0	0	0	4,495	2,629	0	7,124	2	3,562
Total Cost	2,764,422	4,933,272	5,240,085	705,496	471,975	594,154	332,475	15,041,879	401	37,511

Notes: ¹ Based on In-depth Study sample of 304 accidents only.

Active participant is defined to include the participants in control of a vehicle or pedestrians.

TABLE 71: DISTRIBUTION OF SERIOUS ROAD ACCIDENT COSTS BY PRIMARY ERROR
 OF ACTIVE PARTICIPANT - ADELAIDE INNER METROPOLITAN AREA¹,
 MARCH 1976-MARCH 1977 (\$A 1980)

Primary Error	Total Costs 304 accident sample	% Total Cost	Total Costs Inner Adelaide Metropolitan Area
Speed	894,941	5.95	11,187,397
Inadequate response	3,705,820	24.64	46,328,985
Lack of experience	1,456,575	9.68	18,200,672
Inattention and carelessness	5,811,484	38.64	72,652,272
Stress, fatigue and emotion	29,261	0.19	357,245
Alcohol or drugs	2,736,568	18.19	34,201,471
Medical condition	121,649	0.81	1,522,990
Failure to observe traffic rules	229,180	1.52	2,857,957
Other	42,358	0.28	526,466
Defective vehicle	6,919	0.05	94,012
Attempted suicide	7,124	0.05	94,012
Total	15,041,879	100.00	188,023,450²

Notes: ¹ This distribution has not been calculated for all South Australian accidents as there are likely to be significant differences in the relative importance of various primary errors in rural accidents compared with city and metropolitan area accidents.

² Rounding error.

8. SUMMARY AND RECOMMENDATIONS

Serious road accidents in South Australia during the 12 month period from March 1976 to March 1977 have been estimated to cost the community \$274,470,000 in terms of 1976 dollars. This figure has been updated, with the use of appropriate price indices, to \$395,097,000 in terms of 1980 dollars.

The average cost to the community of a death in a road accident has been valued at \$307,158 (\$1980). The average costs to the community when a person sustains critical injuries, or severe, serious, moderate or minor injuries in an accident have been estimated. In terms of 1980 dollars the average costs associated with these non-fatal injury levels are \$205,553, \$88,815, \$8,017, \$4,495 and \$2,629 respectively. An average cost of \$715 represents the cost to the community of the involvement in an accident to which an ambulance is called of a person who is not injured.

These cost estimates can indicate the financial worth of safety proposals and they are useful in reducing any uncertainty in the selection of safety programs. But these estimates are conservative. This fact and the inherent difficulties in expressing fatalities and injuries as losses in money terms mean that the cost estimates should not be used as absolute threshold levels or cut-off points for road safety funding. In particular, they should not be interpreted as upper bounds for the expenditure that can be justified on road safety in South Australia, nor should they be used to reject programs unconditionally on a cost-benefit basis.

For many reasons road safety expenditure is unlikely to be able to be increased to the theoretical maximum indicated by the total cost estimate listed above. For example there are competing demands for funds to save lives and limit injury severity in other areas, such as industrial accident prevention and for more general medical research and treatment programs. In practice there is a limit in dollar terms beyond which further road safety expenditure cannot be justified. The aggregate cost estimates derived in this study can have a useful purpose in allocating funds between the various road safety programs and the other demands on public funds.

The total cost of road accidents is dependent upon the frequency of accidents, the distribution of injury severity and any inefficiencies in post-collision restorative procedures. It may be classified in various ways. In this study, possibly for the first time, costs have been distributed within two sub-sets of these accidents: a categorization by type

of accident and, entirely separate, a classification by type of error (if any) committed by each active participant. The procedure developed in this study could also be applied to many other classifications of the overall cost, such as the costs associated with road and traffic factors. Ultimately it should be possible to develop a cost ranking for all of the known road accident risk factors, allowing for differences in other characteristics of the accidents.

The two examples listed give some indication of the relative importance, within each classification, of the specified errors or types of accident. This, in turn, can be used in assigning priorities for the implementation of countermeasures within the appropriate classification.

It is important to recognise that the distributions of cost that are presented for these two classifications are not independent and the costs assigned to say 'car vs. car' accidents and to 'inattention and carelessness' are not additive. Each is a component of a different classification of the total cost of these accidents. Consequently it is not meaningful to say that 'car vs. car' accidents were less important (at 22.2 per cent of the total costs) than 'inattention and carelessness' (at 38.6 per cent) because the former is a percentage of all types of accident and the latter is a percentage of all types of error committed by the active participants in the accidents. Comparisons should be made within classifications (of types of accident or of types of error) and not between classifications.

With regard to the relative contribution to total cost by type of accident, 'car vs. car' and 'pedestrian vs. vehicle' accidents respectively account for 22.2 per cent and 22.0 per cent. A high contribution is also made by 'single car', 'single motorcycle' and 'motorcycle vs. vehicle' collisions. They respectively account for 13.3 per cent, 11.6 per cent and 11.5 per cent of the total costs (Refer to Table 68).

The types of accident that had an above average cost per accident are those that have relatively high levels of injury severity. In terms of 1980 dollars, the average cost to the community of single motorcycle accidents is \$91,871 and the average costs of 'pedal cycle vs. vehicle' and 'pedestrian vs. vehicle' are \$88,426 and \$82,873 respectively (Refer to Table 67). The lack of crash protection and consequently high risk of injury for the riders and pedestrians in these accidents result in high hospital and medical costs with long periods spent in recovery and therefore off

work. Thus the 'income foregone' and 'pain and suffering' components are also relatively great.

In terms of classification of the costs by errors committed by the active participants, 'inattention and carelessness' accounted for 38.6 per cent of the total. The second highest contribution to total cost is 'inadequate response', accounting for 24.6 per cent. The other errors that make a significant contribution to the total costs are 'alcohol intoxication' (18.2 per cent), 'lack of experience' (9.7 per cent) and 'speed' (6.0 per cent) (Refer to Table 71). Those errors that are associated with above average costs per accident are 'alcohol intoxication', 'lack of experience' and 'inattention and carelessness'. In terms of 1980 dollars the average costs of these collisions are \$82,926, \$80,921 and \$38,743 respectively (Refer to Table 70).

Detailed recommendations for actions that may reduce the number of accidents and the average severity of the associated injuries are given for each type of accident in the series of reports on the Adelaide In-depth Accident Study, on which this study is based (for an introduction to this series, see McLean and Robinson, 1979).

A proportion of the total costs can be attributed to some inadequacy and inefficiency in post-collision restorative actions and procedures. Such restorative action includes all hospital and medical treatment, repair of damaged property, legal and court services, police investigation, towing of damaged vehicles and other miscellaneous processes. Perhaps the area with the greatest potential to influence accident frequency and costs is that of motor vehicle insurance.

This study has been related to only a small part of any overall assessment of the third party motor vehicle insurance system. As such, an integrated and comprehensive assessment of changes that might be made to the system is beyond the scope of this study. However, the information that has been obtained in conducting this report has shown the financial effect on individuals of road accident involvement and it indicates the entitlement to, and the form of the compensation that is available. The information shows a high proportion of non-intoxicated and non-speeding road accident victims that are ineligible for compensation. There is also a general bias against those persons with larger claims as they are subject to longer delays in payment and they tend to be compensated for a smaller proportion of the total losses incurred. The system encourages exaggeration of injury claims and consequently involves expensive legal and judicial services. In order to correct these current inadequacies within the system it is recommended that:

Proper attention be given to the existing inefficiencies and inequities in the compulsory third party insurance system,

and that the information collected for this study be further analysed to identify the characteristics of those persons who are excluded from claiming third party compensation or whose payouts are reduced by the percentage of contributory negligence.

In order to fully investigate the consequences of the current third party insurance scheme, it would be informative to compare the process of rehabilitation and of adjustment to any permanent disability between those persons receiving compensation and those persons deemed ineligible. So that the consequences of compensation may be fully appreciated and appropriate corrective action be undertaken it is recommended that:

Particular regard be paid to the process of rehabilitation according to whether or not the affected persons are receiving compensation.

The quality and quantity of 'indirect' information recorded by the insurer leaves considerable scope for improvement. For future cost analyses of road accidents it is recommended that:

The South Australian data base be broadened with particular reference to the role the State Government Insurance Commission can play in collecting detailed cost information from all persons making third party insurance claims. In developing a list of relevant cost parameters it is recommended that consistency with the Victorian Motor Accident Board be sought - thus facilitating interstate comparisons and a wider data base in total. These parameters will include hospital inpatient and outpatient costs, theatre and chemist costs and private doctor and ambulance costs. The number of weeks away from work and resultant income lost, house-keeping costs and general payments resulting from the accidents should also be recorded. A record of 'recovery' (the amount 'recovered' from S.G.I.C.) is recommended for each cost parameter.

The respondent-completed questionnaire has provided direct and detailed information on the post-accident consequences that are not satisfactorily recorded elsewhere. However, in view of the relatively poor response rate of mail-questionnaires in general it is recommended that:

Where possible resources be made available to conduct personal interviews with the accident participants.

In this study a detailed examination of the characteristics of the non-respondents could not be made due to time constraints and it is recommended that:

A more detailed analysis be made of the (available) characteristics of the 'non-respondents' to determine further to what extent their refusal to co-operate results in biasing of the cost results.

It is also recommended that:

The study of the subjective cost parameters such as family, community and volunteer losses and pain and suffering be taken further.

On the basis of the information that has already been collected for this study, there are several additional areas in which useful research could be undertaken. For example, in many cases the accidents were the result of several contributing factors and it is recommended that:

For each of the 304 case study accidents, the various contributing causes (or active participant errors) be assigned a value indicating their proportionate contribution to the cause of the accident, and that costs be allocated on the basis of the relative importance of each cause (or error).

To achieve the ideal situation for future accident cost analysis it is recommended that:

Contact be established with accident victims immediately after the accident and each victim be made aware of the purpose of the cost study, with regular (not necessarily frequent) consultations between the victims and interviewers.

Such contact would minimise the risk of eliminating small costs and the victims may be more likely to talk about the consequences of the accident while they face the problems rather than several years later when they either want to put it out of their minds or do not remember. In some cases the injured persons may be hesitant to talk before compensation settlement. However, if a feeling of confidence could be created between the interviewer and the victim during the compensation process, the possibility of an open discussion after settlement would be increased.

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THE RESPONDENT-COMPLETED QUESTIONNAIRE

QUESTIONNAIRE DEVELOPMENT AND ADMINISTRATION

Four different respondent-completed questionnaires were formulated to cover the various cost and loss components incurred by different types of accident participant. These questionnaires covered different aspects of the whole range of private and social costs expected to be incurred in an accident. The questions and the analysis were based on the following seven cost categories:

- Section A: Treatment for Injuries after the Accident
- Section B: Cost of Care after the Accident
- Section C: Education and Employment
- Section D: The Effect of the Accident on the Injured Person, the Injured Person's Family or Community Activities
- Section E: Compensation and Advice After the Accident
- Section F: Attitudes of Other Members of Household
- Section G: Comprehensive Insurance of the Vehicle

The four types of questionnaire each cover different aspects of the categories of costs shown above.

1. THE FULL QUESTIONNAIRE covered all seven categories and was consequently appropriate for those people both injured in the accident and responsible for the costs of damage to the vehicle, eg. Injured /Owners:- 189 of these questionnaires were forwarded, 105 (55.6 per cent) were answered and returned but seven of these questionnaires were not completed satisfactorily and as many questions remained unanswered they were not used in this study.

2. NO COMPREHENSIVE INSURANCE QUESTIONNAIRES were identical to the full questionnaire except for the exclusion of Section G, which dealt with the cost of damage to the vehicle, this questionnaire was appropriate for injured participants who had no direct financial interest in the vehicle in which they were travelling. eg. Injured passengers or injured driver/owners if their vehicles were undamaged, or if their vehicles were owned by someone else:- 114 of these questionnaires were forwarded and 43 (39.5 per cent) were answered and returned but three of these were not sufficiently completed to be used in the study.

3. COMPREHENSIVE INSURANCE QUESTIONNAIRES covered Section G only - with questions relating solely to vehicle damage costs.

This questionnaire was only one page long and was appropriate for uninjured persons who were responsible for the cost of damage to the vehicle, eg. uninjured driver/owners or owners of damaged vehicles even if the owner was not involved in the accident. 166 of these questionnaires were forwarded and 104 (62.7 per cent) were answered and returned, all of which could be, and were, used.

4. CHILD'S QUESTIONNAIRE - a modified version of all sections in the full questionnaire incorporating questions relevant to children with questions asked in such a manner that adults could complete them on behalf of the children. Twenty-four of these questionnaires were forwarded and 12 (50.0 per cent) were answered, returned and used.

The four questionnaires were tested in a pilot study where personal interviewers checked for any difficulties involved in interpretation or in answering the questionnaire. Some minor modifications were made after the pilot study but the final questionnaire drafts were used throughout the actual study. They are listed in Appendix C.

The information from the questionnaire covers the 'on-going' costs that are often omitted when cost of accident statistics concentrate on indirect data sources which cannot provide details of individual hardship. Such indirect sources often relate to costs incurred immediately following the accident without regard for on-going home care or long-term disruption to family wellbeing.

The cost of medical treatment (other than that incurred in hospitals for which hospital data is used) is covered in Section A of the questionnaire. Section B covers the cost of home care whether it be provided by a paid nurse or a member of the family who may take time off from work or school during the injured person's recovery period. The questionnaire aims to give greater insight into the disruption of family and community life caused during the recovery of the injured accident victim. The effects on the individual's income and earning potential are examined in Section C, while the effects on the family's mobility, life-style and psychological well-being are covered in Sections D and E. Section F is answered by a member of the family who was not involved in the accident and asks for information on how another member of the family perceives the effect that one member being injured has on the household. The questions in Sections E and F were primarily included

for the Commonwealth Bureau of Transport Economics' Study on Third Party Insurance and Compensation but some of the information has been relevant to this study.

Generally the success rate from mail-questionnaires is not high and it would have been preferable to conduct personal interviews with each of the accident victims. Personal discussion would have given individuals the opportunity to speak freely of their accident experience and often valuable information that is missed in answering specific questions can be collected in this manner.

However, the financial and manpower resources required to undertake the massive task of interviewing all the participants was prohibitive in this study and the second-best alternative of mailing questionnaires was adopted.

Several steps were taken in an attempt to improve the response rate. Where possible, telephone calls were made to participants to explain the purpose of the study and to give notice of the questionnaire. Each questionnaire was accompanied by a covering letter and reply-paid envelope. The covering letter, shown in Appendix C, again explained the purpose of the study and stressed the importance of completing and returning the questionnaire. This was particularly important for those individuals who did not have telephones and consequently could not be contacted before receiving the questionnaire. The covering letter stated that if the questionnaire had not been returned within three weeks, each recipient would be contacted to see if assistance was required.

The follow-up contact, if needed, was undertaken in two parts. The first follow-up was made after one month and the second after two months. The follow-up calls after one month were made by two trained interviewers who were recommended to us by the Commonwealth Bureau of Statistics. Their aim was to contact all the participants who had not returned their questionnaires, to determine the state of completion of the questionnaire, to offer any assistance needed and to encourage a fast return of the completed questionnaire. The follow-up calls were made on the telephone wherever possible and otherwise by a personal visit to the house of the accident participant. If no one was at home during a personal visit, a letter was left explaining the purpose of the visit and giving a contact telephone number to ring if help was needed to complete the questionnaire.

The final reply rate was 54.9 per cent. A 70.0 per cent reply rate was obtained from the sample of persons who were phoned prior to receiving the questionnaire and a 29.2 per cent reply rate from those persons who were not phoned.

Some individuals had kept detailed cost records and their questionnaires provided extremely reliable cost estimates.

In one case a participant had kept a record of each taxi fare to and from the Royal Adelaide Hospital for outpatient visits. In the cases where private companies or Government institutions owned the damaged vehicles, the information on cost of damage was usually recorded at the time of the accident and was therefore very reliable. However, in the majority of cases no detailed records had been kept and the individuals had difficulty in remembering the exact costs of the accidents - many of the questionnaires had questions left unanswered and correspondingly the reliability of the questionnaire results should be qualified.

A thank you letter was sent to each participant on receiving the completed questionnaire.

The response rates achieved on the basis of those questionnaires that were sufficiently complete to use have been listed as follows:

- 51.9 per cent for the full questionnaire;
- 36.8 per cent for the 'no comprehensive insurance' questionnaire;
- 62.7 per cent for the 'comprehensive insurance only' questionnaire;
- 50.0 per cent for the child's questionnaire.

The percentage response rates are calculated on the number of questionnaires that were actually mailed to the accident participants. However 187 of the participants could not be traced, 12 had died, another 59 were unwilling to co-operate and ten were living either overseas or interstate.

The other group of non-respondents who were traced and located but still refused to participate either returned a blank questionnaire or did not return the questionnaire at all. The reasons for refusal were usually not made explicit but for some people there was a strong unwillingness to resurrect the feelings of guilt, sadness or bitterness associated with the accident.

Those participants legally 'at fault' in the accident were less likely to discuss it and answer questions. In cases where litigation was pending or continuing the refusal rate was high.

The respondent and non-respondent groups were examined for any indication of potential bias in the cost calculations due to the non-response. The mean ISS for the respondents was equal to 2.67, slightly higher than the mean ISS of 2.21 calculated for the non-respondents. Although this difference suggests that the injury-related cost estimates derived from the questionnaires may be slightly greater than the true average costs, it is not statistically significant and may therefore have arisen solely from random variation in the response.

It is interesting to compare the frequency with which the various road users were represented in the group of

respondents and in the group of non-respondents. Car drivers exhibit the most significant increase in representation in the respondent group (Table A1). They increase from 39.8 to 70.1 per cent. Pedal cyclists also increase in representation from 1.5 to 4.3 per cent. Motorcyclists and pedestrians show only slight reductions of 0.9 and 0.8 per cent respectively, while passengers and pillions show a significant reduction in representation from 46.8 to 15.4 per cent. The passengers and pillions are not in control of a vehicle and generally they have no part in the causation of an accident. Correspondingly their long-term interest in the accident and its consequences is often less than that of the active participants.

RESULTS AND DISCUSSION

The respondent-completed questionnaires have provided a useful method of obtaining information that cannot be derived from indirect data sources.

The difficulties associated with the use of the questionnaire have been detailed earlier in this study. The small sample size and the regional nature of the data must limit the degree to which we can confidently extrapolate from the data for South Australian or Australian trends. The results are not definitive, but rather give an insight into the effects of road accident trauma that cannot be gained with sole reliance on the data sources that are only indirectly related to the victims.

The questionnaires have covered many consequences of accidents that are usually given only brief mention in accident studies. Private medical and dental treatment (not included in any hospital records) and ancillary treatment from dentists, physiotherapists, chiropractors, occupational therapists or others have been considered. The cost of care after a patient leaves hospital often cannot be measured in dollar terms, particularly when a member of the family, relative or

friend devotes (unpaid) time to caring for the patient. The answers we have received give insight into the problems and disruption faced by the family after the accident.

The limitation of activity in the family and community are considered and in many cases despite an inability to interpret the effects in dollar values - a realistic insight into the problem is gained.

The number of questionnaire answers in each ISS category was not always representative of the proportion of ISS categories within the case study population and consequently the answers were weighted to ensure the results were representative of the total population by injury severity.

In this appendix some of the questionnaire answers are examined in greater depth. The aim is not to give a comprehensive review of all answers but to detail those areas considered to be most informative. With additional time and resources all the questionnaire results could be fully evaluated and the potential for future research is considered in the final section of the report.

In this study, information is given on those questions that have been used to calculate costs and on other questions that give valuable insight into areas where dollar costs are unattainable and the problems are usually described as 'intangible'.

Private Doctor Treatment

Section A - Question 1, 3 and 4.

1. Did you see a doctor(s) other than at a hospital for treatment of conditions related to the accident? YES/NO
If YES - how many times did you see the doctor(s)?
3. What was the total cost to date of all doctors visits (outside hospital) relating to your accident injuries including X-rays, tests, etc.? \$.....

TABLE A1: TYPE OF ROAD USER BY QUESTIONNAIRE RESPONSE

Type of Road User	Non-respondent	Respondent
Car driver	39.8	70.1
Pedal cyclist	1.5	4.3
Motorcyclist	7.2	6.3
Passenger/Pillion	46.8	15.4
Pedestrian	4.7	3.9
	100.0	100.0

4. Who eventually paid for the doctors bills?

Please tick correct box(s)

Insurance company : name of company.....
Medical health fund : name of fund
Workers compensation : name of company ...
You/your parents
Someone else : please specify
Not paid

Treatment from private doctors was sought by 75 persons (50.0 per cent of the injured questionnaire respondents). Their needs for treatment were quite diverse, many persons saw their private doctor only after finalising hospital treatment, while others sought 'check-ups' immediately after the accident in preference to hospital treatment and others sought longer term 'specialist' advice from private doctors.

The number of visits for such treatment ranged from 1 to 50 per person with over 50 per cent (46 persons) of those seeking treatment making less than three visits. The cost of additional treatment varied between a minimum of \$6.00 and a maximum of \$800.00. The most informative cases (with emphasis on the most costly situations) are discussed below.

A female car passenger in a two car collision (Accident 268) was initially allocated an ISS=1 for abrasions and swelling. She was treated in the Casualty section of The Queen Elizabeth Hospital and allowed to go home immediately afterwards. Since that time whiplash injury symptoms associated with a cervical spine injury from the accident have continued to persist. This has resulted in an estimated seven and a half per cent loss in body capacity in terms of work and recreation. This 39 year-old female has also paid \$250.00 for physiotherapy treatment and the cost of her additional medical attention is the major proportion of the total medical cost in this case.

A 17 year-old car driver involved in Accident 066 - a three car collision - and a pedestrian aged 22 years who was struck by a commercial vehicle (Accident 106) have both paid \$500 for additional medical treatment. The car driver had an ISS=2 and was treated in Casualty for concussion and severe shock. The doctor's fees related to neck pain that developed four weeks after the accident.

The female pedestrian in Accident 106 was also treated for shock and concussion in Casualty and allowed to go home. She had an ISS=5 but subsequently she suffered post-concussion syndrome and one month after the accident severe neck pains developed. She states in the questionnaire that she "... still suffers from neck and lower spinal pain but cannot afford the time for treatment." She lost her job soon after the accident, as her employer did not consider her to be sufficiently capable. Her marriage was brought forward as she "needed someone with her".

A six year-old female passenger involved in a two car collision (Accident 066) sustained abrasions to the forehead and a laceration to her lip. She spent

two days in hospital and subsequently made eight visits to a private doctor for follow-up treatment that cost \$155.50.

Accident 281 involved a motorcyclist and pillion passenger in a collision with a taxi. The motorcyclist suffered injury to his cervical spine which resulted in temporary but total paralysis and loss of sensation in the left arm. He was assigned an ISS=1 and treatment at the time of the accident was in Casualty - his subsequent visits to a psychiatrist and private doctor resulted in additional costs of \$135.00.

In Accident 197, a two car collision, the 17 year-old driver of one vehicle suffered concussion, bruises and a lacerated right foot. He was admitted to hospital for two days and was assigned an ISS=5. The additional medical costs of \$130.00 were the result of continuing treatment to the severed tendon in his ankle.

Additional medical costs of \$100.00 were paid by a 14 year-old pedestrian who was injured (ISS=2) in Accident 153 when he was hit by a Datsun sedan. He was treated in Casualty immediately after the accident for abrasions and bruises to the legs. A private doctor was seen four times after this initial treatment.

A 64 year-old female pedestrian who was struck by a vehicle towing a trailer was assigned an ISS=8 (Accident 103). Her injuries were a fractured pelvis, concussion, bruising and abrasions. She was admitted to hospital for 34 days and both her inpatient and outpatient treatment costs were high but additional medical attention costing \$130.00 was required, particularly for failing eye-sight which she attributed to the accident.

For those persons who completed and returned the questionnaire and also stated that they had had additional doctors treatment, the highest ISS assigned was 22. This was assigned to a 27 year-old male driver of a Volkswagen 1300 who, in Accident 126, was involved in a collision with a Holden sedan. He was in hospital for four days suffering from a bruised back, broken ribs and facial abrasions. His cost of additional medical care was \$8.00, near the minimum recorded. The total inpatient costs were \$652.00 with no outpatient costs reported. His injury recovery rate was fast and the number of follow-ups was minimal.

The next highest ISS (=17) was for a 21 year-old motorcycle pillion passenger who received a fractured jaw, a fractured right leg and severe concussion in a collision with a car in Accident 042. In this case the inpatient costs and subsequent outpatient costs were high and the \$14.00 fee for additional medical attention constituted only a small proportion of the total cost.

Two of the accident victims seeking additional doctors' treatment were assigned ISS=14 ratings. The first, a 34 year-old male pedestrian involved in a collision

(Accident 026) with a Ford Falcon utility suffered concussion, lacerations, bruises and a fractured lumbar spine. He spent seven days in hospital with hospital in-patient costs equal to \$1141.00, outpatient costs equal to \$292.50 and paramedical costs equal to \$387.50. The additional treatment cost of \$25.00, again, was only a small proportion of the total cost of treatment.

The second victim assigned an ISS=14 was a 16 year-old female cyclist involved in a single bicycle accident. Her injuries were primarily facial with a cracked jaw bone, a depressed fracture of the cheek bone, eight fractured teeth, facial lacerations and also concussion. She spent two days in hospital and the \$14.00 private doctor's fee was incurred to have stitches removed but the major follow-up treatment was with dentists and, as such, is included in the following section.

The incidence of costs of private doctors' attention is shown in Table A2.

Additional Medical Treatment

Section A - Question 5

5. As a result of the accident did you have any other treatment (outside hospital) e.g.: from dentist, physiotherapist, chiropractor, occupational therapist or other? YES / NO

If YES - for which injury?
 - which service?
 Dentist - how many visits?
 Physiotherapist - how many visits?
 Chiropractor - how many visits?
 Occupational therapist - how many visits?
 Psychiatrist - how many visits?
 Other : please specify
 What was the total cost of this 'other' treatment for injuries? \$.....

Dental Treatment

Dental treatment was required by 16 persons (or 10.7 per cent of the injured respondents). Only seven persons were able to record the exact fee for treatment and the range of costs was from \$10.00 to \$650.00; the number of visits to the dentist varied between one and 20 (with three unknowns) but the costs of treatment are not necessarily reflected in these numbers. Inevitably treatment sessions vary in duration, the materials used depend on the nature of the damage and the cost is dependent on these factors as well as the number of visits to the dentist.

Eight of those persons seeking dental treatment were involved in car vs. car collisions, four were involved in single car collisions and one person was involved in each of a 'car vs. multi-vehicle', a 'motor-cycle vs. vehicle', a 'single motor cycle', a 'bicycle vs. vehicle' and a 'miscellaneous' accident. Those persons receiving dental care do not form a distinctive group and any conclusions drawn from the small sample size are not definitive.

TABLE A2: PRIVATE DOCTORS' TREATMENT - SOURCE OF FUNDS

Private Doctors' Treatment Source of Funds	Number of Respondents		% Respondents Needing Private Doctor Treatment
	Direct	Allocation to Six Major Sources	
Insurance Company	15	19	27.1
Medical Health Fund	25	28	40.0
Workers Compensation	7	8½	12.1
You/Your parents	9	10	14.3
Someone Else	1	2½	3.6
Not Paid	2	2	2.9
Insurance Co. and Health Fund	3		
Insurance Co. and Workers Comp.	2		
Insurance Co. and Self/Parents	2		
Insurance Co. and Someone Else	1		
Health Fund and Workers Comp.	1		
Health Fund and Someone Else	2		
	70	70	100.0

A 31 year-old female driver paid the highest fee of \$650.00 for dental treatment received over several months after the accident. She was involved in a two-car collision (Accident 124) and was assigned an ISS=4 with injuries sustained to her teeth, gums and mouth.

In Accident 042, a 'motor-cycle vs. vehicle' collision, the 21 year-old motorcycle pillion passenger sustained severe injuries and was assigned an ISS=17. His dental costs were \$255.00 incurred in the treatment of a fractured jaw.

A \$200.00 fee for dental treatment was charged to the male driver of a Morris-Mini van. He was struck by a wooden plank that slid forwards off a Bedford truck (Accident 111). He sustained lacerations to the right cheek and above the left eye. The dental fee was paid for treatment of his fractured jaw.

The 22 year-old male passenger in a two-car collision (Accident 084) sustained a lacerated upper lip, contusions to the face and mouth and the loss of three upper incisor teeth and a fractured jawbone. The dental fee was \$200.00.

These cases cover the most costly dental treatments. Three of the four cases centred around treatment for a fractured jaw, and this, often slow-healing, injury results in higher costs than other types of dental treatment.

The lowest fee, of \$10.00, was for treatment of a chipped tooth sustained by a 24 year-old male car driver involved in a two-car collision (Accident 020). He described his only other injury as being a "bumped skull".

The other relatively minor charge of \$30.00 was paid by a 16 year-old motorcyclist involved in a collision with a Bedford truck (Accident 093). The injuries he sustained were "damaged front teeth" and a lacerated left knee - two dental visits were required.

Physiotherapy Treatment

Physiotherapy treatment was sought by 13 injured respondents (i.e. 8.7 per cent of all injured respondents). Of these, six were involved in two-car collisions, three in 'motor-cycle vs. vehicle' collisions and one each in a 'pedestrian vs. vehicle', a 'pedal cycle vs. vehicle', a 'single car' and a 'miscellaneous' collision.

The cost of treatment was recorded by eight of the respondents and covered a range from \$8.00 to \$250.00. Often the injury being treated was not obvious immediately after the accident. Treatment was often related to back and neck injuries that developed symptoms after several days or weeks and in some cases after months. The number of visits made to the physiotherapist was recorded by all but one respondent. They ranged between one and 36 visits.

The 34 year-old car driver in Accident 090 stated she had no pain three days after the accident and her X-rays were normal. However several weeks after the accident a 'severe' neck pain developed and in a personal interview during 1980 she stated she had attended at least 36 physiotherapy appointments since the accident and that she was currently awaiting an expected \$20,000 third party compensation claim, having stated she is now capable of only part-time work. No cost of physiotherapy treatment was given.

In Accident 026, a 34 year-old male pedestrian was struck by a Ford Falcon Utility and, in addition to general bruising, lacerations and concussion, he sustained a fractured lumbar spine. He estimates he has seen a physiotherapist about 35 times since the accident and that he still suffers back pain and is unable to do hard work. As a result of his residual disabilities he states his life and the life of his family has not returned to normal and that it is never likely to do so. He was unable to estimate the cost of physiotherapy treatment as all medical fees were sent straight to the insurance company.

A 30 year-old female passenger in a two-car collision (Accident 268) sustained injuries recorded as 'abrasions and swelling' immediately after the accident. However in the following month a severe whiplash injury became evident and she now has limited movement of the cervical spine resulting in an estimated seven and a half per cent loss in work and recreational capacity. Her costs of physiotherapy treatment totalled \$250.00.

Physiotherapy costs of \$200.00 have been incurred by the 47 year-old Morris Mini van driver in Accident 111. His additional treatment included visits to both the dentist (discussed in the previous Section) and the physiotherapist, where he has received treatment for a persistent disability affecting his right shoulder and lack of full control over lip movements and restriction of jaw movements.

The 28 year-old female car driver involved in a two-car collision (Accident 009) sustained concussion and severe facial lacerations in the accident. She received compensation for these injuries from a third party insurance payout soon after the accident. She states in her questionnaire "... the whiplash injury didn't appear until three to four months after the accident so therefore was not compensated for...". She has received treatment six to eight times from a physiotherapist at a cost of \$96.00 and also 35 visits have been made to a chiropractor at a cost of \$280.00. She now pays for this treatment herself and will continue to do so.

The 23 year-old male car driver in Accident 212 has been considered under the Section of 'Continuing Treatment'. At the time the questionnaire was returned he had made 25 visits to a physiotherapist and five visits to specialists (with a

total cost of \$175.80). His injuries at the time of the accident were a tender sternum, bruised central abdomen and abrasions to the right knee. The back pain that still persists is a residual effect of these injuries.

Psychiatric Treatment

Two persons, representing 1.3 per cent of the questionnaire respondents that were injured, received psychiatric treatment after the accident.

A 21 year-old female passenger in a two-car collision (Accident 206) sustained serious injuries, a fractured right femur, fractured left wrist, concussion, bruised chest and a fractured tooth. She was assigned an ISS=14. She subsequently visited a psychiatrist once and a dentist four times but no cost of treatment was given.

A 27 year-old motor-cyclist involved in a collision with a taxi (Accident 281) sustained injuries to his left arm and cervical spine. These injuries resulted in temporary paralysis to the arm. He states that seven to eight visits were made to a physiotherapist and four to five visits to a psychiatrist.

Occupational Therapy and 'Other' Treatment

No visits were made to occupational therapists, but five persons sought 'other' treatment, from specialists. There was no distinctive pattern in terms of type of injury or type of accident that distinguished those seeking 'other' treatment. The specialists that were consulted were a neurosurgeon, an ear, nose and throat

specialist, an eye specialist, an orthopaedic surgeon and two visits were made to a psychologist.

Table A3 summarises the incidence of costs for all additional medical treatment.

Continuing Treatment

Section A - Questions 8 and 9

8. Are you still being treated for your injuries? YES / NO
 If YES - what is the cost of this treatment each week? \$.....

9. Who do you expect to pay for this treatment?
 Insurance company
 Medical health fund
 Workers compensation
 You/Your parents
 Someone else : please specify

There were seven persons (or 4.7 per cent of the 150 'injured' respondents) who stated that they were still receiving treatment for the injuries received in the accident, but only four were able to estimate the cost of this treatment. There were a further 11 persons who did not complete the question and they have been listed as unknown in this parameter.

The costs of continuing treatment were stated to be between \$1.00 and \$15.00 per week; these costs are not high and again the result of there not being any paraplegics or quadraplegics in the study is evident. The costs of continuing treatment

TABLE A3: ADDITIONAL MEDICAL TREATMENT - SOURCE OF FUNDS

Additional Treatment Source of Funds	Respondents Needing Additional Medical Treatment	
	Number	Per cent
Insurance company	10	35.7
Medical health fund	2	7.1
Workers compensation	1	3.6
You/Your parents	7	25.0
Someone else	0	0
Not Paid	1	3.6
Medical Health Fund and Someone else	1	3.6
Medical Health Fund and Self/Parents	4	14.3
Insurance Company and Self/Parents	2	7.1
	28	100.0

and care for those persons who are severely and permanently impaired is very high and significantly greater than the maximum of \$15.00 per week in this survey.

There does not appear to be a common factor linking the seven cases. The relevant accidents were a 'single car', a 'motor-cycle vs. vehicle', a 'bicycle vs. vehicle', a 'car vs. multi-vehicle' collision and three 'car vs. car' collisions.

A 21 year-old female motorcyclist in Accident 043 suffered a sprained right knee, grazes and bruises and estimated her current treatment (of a back injury that developed some time after the accident) to be \$40-\$50 annually (or an average of one dollar per week). Assigned an ISS=1 at the time of the accident there was little immediate indication of the long-term treatment costs to follow. She was treated in Casualty and not admitted to the hospital but her follow-up treatment involves visits to physiotherapists and chiropractors.

A back injury resulted in continuing treatment with specialists and physiotherapists for a 23 year-old male driver in Accident 212 - a 'car vs. car' collision. Assigned an ISS=3 at the time of the accident he sustained a bruised central abdomen and sternum and abrasions to his knee. There was little indication of the back problems that would develop. This driver has seen a doctor 19 times since the accident and the visits continue at an average cost of \$7.50 per week.

A 41 year-old male cyclist in Accident 023 also has continued treatment with a physiotherapist for spinal and back injury and in this particular case the ISS=17 assigned at the time of the accident gives some insight into the potential need for long term treatment.

A 64 year-old female driver involved in a collision between two cars (Accident 116) has estimated her continuing treatment from a chiropractor to cost approximately \$15 each week. Her right hip was dislocated in the accident and all further treatment has related to this injury.

Generally it does appear to be those "difficult-to-diagnose" injuries with no necessarily straight-forward healing process (e.g. back and neck injuries) that result in on-going treatment and correspondingly higher costs of treatment and care.

Despite the small sample and the consequential problems of interpretation Table A4 has been included to show the incidence of costs of continuing treatment.

While this study has not investigated the on-going treatment required by paraplegics and paraplegics, the costs of this treatment are most significant and this area is recommended for future research.

Extra Care at Home and Employment of a Home Nurse

Section B - Questions 3, 4, 5, 6 and 9.

3. When you arrived home did you need any extra looking after? YES / NO
4. When you arrived home who looked after you? Please tick correct box(es)
 - Member of your family (including relatives) who usually lived with you at the time of the accident.
 - Member of your family (including relatives) who did not usually live with you at the time of the accident.
 - Neighbour
 - Home nurse who was paid
 - Other : please specify
5. How many weeks did the above person spend looking after you? weeks
6. If you received any care (do not include treatment in Section A) after you left hospital what was the cost of this care? \$.....
 - Who eventually paid for it?
 - Insurance company
 - Medical Health Fund
 - Workers Compensation
 - You/Your parents
 - Someone else
9. If you did not employ a home nurse. If compensation money had been available to you at that time, would you have employed a home nurse? YES / NO

From the 150 injured persons who completed and returned the questionnaire 61 persons (40.7 per cent of injured respondents) needed extra 'looking after' when they returned home. This extra care was usually provided by members of the family living with the victim. Table A5 provides a summary of the answers to Question 4, indicating who looked after the injured persons at home.

The duration of additional care required by the injured persons varied between one and 52 weeks with 61 per cent of victims needing less than two weeks' additional care.

A 41 year-old pedal cyclist involved in a 'bicycle vs. vehicle' collision (Accident 023) required the longest period of care (52 weeks). He had a leg in plaster for eight months and this significantly reduced his mobility (and that of his family) and his ability to care for himself. In this case back and neck pain resulting from the accident still persists and still requires treatment.

A 40 year-old car driver involved in Accident 029, a 'car vs. multi-vehicle' collision, was given intensive extra care by his wife (a trained nurse) for 32 weeks. This participant still requires treatment for his injuries (severe concussion and resulting partial paralysis), and still requires some additional care and help in undertaking 'normal' activities.

TABLE A4: CONTINUING TREATMENT - SOURCE OF FUNDS

Continuing Treatment Source of Funds	Respondents Receiving Continuing Treatment	
	Number	Per cent
Insurance company	1	14.3
Medical health fund	1	14.3
Workers compensation	0	0
You/your parents	4	57.1
Someone else	0	0
Free treatment	1	14.3
	7	100.0

TABLE A5: PROVISION OF CARE AT HOME FOR INJURED PERSONS

The Source of Care Provided	Respondents Needing Extra Care	
	Number	Per cent
Live-in family member	47	77.1
Live-out family member	8	13.1
Neighbour	0	0
Paid Nurse	1	1.6
Other	2	3.3
Live-in and Live-out family member	2	3.3
Live-in family member and other	1	1.6
	61	100.0

TABLE A6: HOME CARE IMMEDIATELY AFTER THE ACCIDENT - SOURCE OF FUNDS

Home Care Source of Funds	Respondents Needing Home Care	
	Number	Per cent
Insurance company	2	25.0
Medical health fund	1	12.5
Workers compensation	2	25.0
Self/Parents	3	37.5
Someone else	0	0
	8	100.0

In neither of the above cases was any cost of care recorded. There were 12 persons (eight per cent of the injured questionnaire respondents) who stated they had paid for home care but of those, only four were able to record the exact costs of that care. In the majority of cases (as in the two most significant cases already discussed) it was provided free of charge by a family member. The costs of care that were recorded were \$10, \$120, \$400 and \$500 and the incidence of the extra home care costs is summarised in Table A6.

The cost of home care used in this study was calculated on the basis of the number of people stating they needed extra care and the number of weeks it was provided. On the basis of these questionnaire results an average cost of care (the average female full-time wage in South Australia, 1976) was applied.

One of the most informative aspects of home care is provided with the analysis of Question 9. This concerns the potential employment of a home nurse had compensation money been available.

We would expect that the persons answering "YES" to this question would have had certain distinguishing characteristics, exacerbating the need for a paid nurse rather than relying on family help. In those cases where caring for the injured person resulted in severe hardship, for example, when the family (or friends) lost income through staying away from work to care for the victim. In some cases the patient's immobility and demand for attention caused the family to become generally immobile resulting in a severely restricted level of activity. In other cases the injured person may have needed specialist nursing attention, perhaps the most important case being where there was no family member to care for the victim and a paid nurse was the only alternative.

Section D of the questionnaire - 'The Effect of the Accident on the Injured Person, the Injured Person's Family or Community Activities' was designed to give information on how the family's activities, income and wealth were affected as a result of the accident. The most important questions in the context of additional care are Questions 2, 3 and 4.

2. Were the activities of your family limited as a result of the accident? YES / NO

If YES - were they limited because:
 Someone had to care for you while you recovered.
 Your vehicle was written-off and your family had no other private transport.
 Your vehicle was damaged and not available while being repaired.
 Your injuries reduced your mobility and as a result of this your family's mobility.
 Another reason: Please specify

If YES - how long was it before the activities of your family returned to normal?

3. Did members of your family or friends lose income as a result of hospital visits, nursing you or doing jobs you previously did? YES / NO

If YES - please state gross income lost per week by family \$.....
 - and the number of weeks in which income was lost weeks
 - please state gross income lost per week by friends \$.....
 - and the number of weeks in which income was lost weeks

4. Did members of your family or friends have to take time off from school as a result of hospital visits, nursing you or doing jobs you previously did? YES / NO

If YES - please state the average number of hours per week hours
 - and the number of weeks in which time was lost weeks

Twelve of those persons who completed and returned the questionnaire indicated that they would have employed a home nurse had compensation money been available at the time.

Ten of those victims were cared for by members of the family who usually lived at home, one was cared for by both a member of the family who lived at home and a member of the family who did not live at home. The one remaining person had no family and was forced to take care of herself despite sustaining injuries that really required her to have additional help.

Ten of those who wanted a home nurse stated that their family activities had been limited and the details of the causes and extent of such limitation are shown in Table A7 for all persons wanting a home nurse.

The 34 year-old pedestrian in Accident 026, a 'pedestrian vs. vehicle' collision, states his own activities will never return to normal. Assigned ISS=14, he required care from a member of his family for five months and it was 32 weeks before the activities of his family returned to normal.

Accident 027 involved a 27 year-old female driver in a two-car collision. She was assigned ISS=1 but her family's activities did not return to normal for ten weeks after the accident primarily because the family vehicle was damaged and was not available for use while being repaired. Also someone had to care for her but as she had only minor injuries she suffered only a little restriction in her activities.

A six year-old female passenger in Accident 066, a two-car collision, sustained abrasions and lacerations, and one parent was obliged to stay home from work for one week to take care of her. The loss in income was estimated to be \$134.00 and the family's financial difficulties were increased as their vehicle had to be repaired.

TABLE A7: HOME CARE AND RESTRICTED FAMILY ACTIVITIES FOR THOSE PERSONS WHO WOULD HAVE LIKED TO EMPLOY A HOME NURSE

Accident No.	Home Care Provided by ..		Weeks of Home Care	Cause of Family's Limited Activity	Duration of Family's limited activity (in weeks)	Income lost by Family	Time from normal activity by Family
	Self	Family Member living at home					
026		1	20	Care for injured and reduced mobility	32	-	-
027		1	2	Care for injured and vehicle repair	10	-	-
066		1	1	Vehicle repair	1	\$134	1 week (from work)
103	1		9	Own injuries	-	-	-
119		1	6	Care for injured and reduced mobility	20	-	6 weeks (from school)
126		1	1	Patience required	2	-	-
138		1	1	Unknown	-	-	-
222		1	2	Care for injured and vehicle repair	28	-	2 weeks (from school)
226		1	2	Care for injured and reduced mobility	12	\$200	2 weeks (from work)
259		1	13	Care for injured and reduced mobility and vehicle written off	For ever	-	-
262		1	1	13	Reduced mobility	52	7 weeks (112 hours from school)
297		1	4	Reduced mobility	12	-	-

The 64 year-old female pedestrian injured in Accident 103 was obliged to take care of herself after being discharged from hospital. She suffered a fractured pelvis, shoulder bruising and concussion and was assigned an ISS=8. She states her activities are still, and will remain, limited and she states that although she managed as well as she could after the accident, a home nurse would have been a tremendous help.

A 17 year-old male car passenger in Accident 119, a single vehicle collision, stated his own activities were limited 'a lot' and consequently his family's activities were limited because they had to care for him while he recovered. His lack of mobility restricted his family's mobility also. It was 20 weeks before the activities of the family returned to normal, but the injuries sustained by the victim are not solely attributed to the collision as the victim was involved in a fight before the accident.

A male car driver, aged 27, involved in Accident 126, (a two-car collision) was assigned an ISS=22. His activities were limited for three weeks but in this time he had returned to work and the restriction was primarily a result of pain in moving. He states his family's activities were limited for about two weeks. This was mainly due to additional patience needed in their activities as the victim took "... a little longer to finish anything, as movement was painful."

A 14 year-old female passenger in a two-car collision, Accident 138, sustained lacerations and bruises and was treated in Casualty at The Queen Elizabeth Hospital and then allowed to return home. She required one week of extra care from a member of her family. Although her family's activities were not limited, she states a home nurse would have been employed had compensation been available.

A 19 year-old female driver of a vehicle in Accident 222, a two-car collision, was assigned an ISS=1. She states her family's activities were limited for 28 weeks as a result of the care given to her and also because the family's vehicle was damaged and not available while being repaired. She states that 80 hours were lost (40 hours x 2 weeks) as a result of family or friends taking time from school for hospital visits, nursing or doing jobs the victim had previously done.

A 14 year-old schoolboy riding a pedal cycle was involved in a collision with a car (Accident 226). He was assigned an ISS=17 for a fractured leg, concussion and numerous abrasions. A member of the family cared for him for two weeks on his return home and this caused a \$200.00 loss of income. The family activities were limited for a total of 12 weeks.

A 34 year-old driver of a vehicle involved in a two-car collision, Accident 259, suffered a dislocated hip, concussion, scalp contusions and bruising. Assigned

an ISS=14 the victim has permanently lost 25 per cent of his full work capacity and the injuries have obviously had a major impact on the family unit. Immediately after the accident there were three reasons for the family's activities being restricted. Someone had to care for the victim, his injuries and the care he required reduced the family's mobility and the family vehicle was written off. The victim states it was 52 weeks before his activities reached the new (reduced) capacity level and his family's activities were unlikely ever to return to normal. He states that the severe and long-term effects on the family would have been significantly lessened with a home nurse.

The care given to the 70 year-old pedestrian in Accident 262 resulted in the mobility of his family being reduced. It was 52 weeks before his own or his family's activities returned to normal. In this case no income was lost but members of the family had to take 112 hours (16 hours x 7 weeks) off from school as a result of hospital visits, nursing or doing jobs that the injured person had previously done. Thirteen weeks of intensive home care were given after his release from hospital.

A 12 year-old cyclist was involved in a 'bicycle vs. vehicle' collision (Accident 297). He was assigned an ISS=9 for concussion and a serious foot laceration requiring a skin graft. On his return home after a total of five and a half weeks in hospital, he required constant additional care for four weeks. Despite the family's activities being restricted for a total of 12 weeks, only two days were taken off from school and no income was lost in providing the additional care.

In eight of the above twelve cases it is obvious that the employment of a home-nurse would have made a significant difference in alleviating the pressure of long periods of attention and extra care provided by family members (or by the victim herself as in Accident 103). In the remaining four cases the employment of a home nurse is regarded as desirable but is not associated with the same potential benefits in reducing the hardships of intensive home care.

Continuing Care

Section B - Questions 7 and 8

7. Are you still being cared for because of your injuries? YES / NO
If YES - what is the cost of this care each week? \$.....
8. Who do you expect to pay for this?
Insurance company
Medical health fund
Workers compensation
You/Your parents
Someone else : please specify

Three of the respondents to the questionnaire indicated they were still receiving additional care as a result of their injuries. Only one person was able to estimate the cost of this care (\$8.00 per week) and the remaining two recorded "unknown costs".

A 23 year-old car driver involved in a two-car collision (Accident 212) still receives care (estimated cost of \$8.00 per week paid for by himself) for a back injury that is a residual effect of the injuries sustained in the collision. He states in his questionnaire that as a result of the injuries, his activities within his family and also his family's activities have not returned to normal and they are not likely to do so. His marriage has broken up as a result of the accident.

The severe injuries received by a 40 year-old male driver in a 'car vs. multi-vehicle' collision (Accident 029) have resulted in on-going costs of treatment and care. Assigned an ISS=18 he sustained severe concussion, 'temporary' paralysis of the left side of his body, abrasions and lacerations. His wife writes: "...continual exercises with weights (sandbags) for leg and arm development were carried out at home for many months. Each day I took him to a heated pool which helped a great deal with his co-ordination and muscle development which in turn also helped his confidence which had been lacking greatly...". His employer arranged a car and a driver to return him home or to the swimming pool each day for months whilst he worked part-time. His wife, a trained nurse, continues to care for him and although no cost for this care is given in dollar terms, the opportunity cost in terms of time and effort are extremely high.

The other injured person still requiring care was a 17 year-old passenger who was involved in Accident 119, a 'single car' collision. He was assigned an ISS=9 for injuries he received to his head, chest and back but these injuries were primarily sustained in a fight before the vehicle accident and his continuing care cannot be attributed to the accident.

As there are no paraplegics or quadriplegics included in this study, the costs of care suggested by the questionnaire results are an underestimate for road accidents in general but some allowance has been made for this in the total cost of care estimates calculated for this study.

Employment

Section C - Questions 9, 10, 11, 12, 13, 15, 16 and 23.

9. Did the injuries received in the accident reduce your chance of promotion or of increasing the size of your business?
 No
 Possibly - but not very much
 Yes

10. Did the injuries you received in the accident cause you to lose your job or change your job? YES / NO
 11. If you have not returned to work, do you expect to ever return to work? YES / NO
 12. How long after the accident did you start looking for a job? weeks
 13. Were you out of work while looking for a new job? YES / NO
 15. Was your new job with the same firm? YES / NO
 16. Was your new job on a higher/lower/same wage than before the accident?
 23. Was anyone employed to do your job while you were recovering? YES / NO
 If YES - please state how soon after the accident they were first employed ...
 - please state how long they were employed to do your job
 - please state if they were employed part-time or full-time

From the 150 injured persons responding to the questionnaire, six persons (4.0 per cent) stated their injuries had definitely reduced their chances of promotion or of increasing the size of their business. Another 11 persons (7.3 per cent) stated their injuries had possibly had this effect.

Eight persons (5.3 per cent of the questionnaire respondents) either lost their jobs or were required to change their jobs as a result of the injuries received in the accident. Table A8 shows the level of injury for each of these persons and whether or not they were involuntarily unemployed while looking for a new job.

A 41 year-old male cyclist involved in a 'pedal cycle vs. vehicle' collision (Accident 023) sustained a fractured femur, spinal injury and much bruising in the accident. He was assigned an ISS=17. He did not return to work for 40 weeks and was replaced after one week by another employee. On returning to work he found that he was unable to do the heavy lifting work that he had previously undertaken and he was moved, within the same company, to a "less strenuous" position. Even now, five years after the accident, he does not consider himself strong enough to continue his pre-accident work.

A 34 year-old female car driver involved in a two-car collision (Accident 090) was assigned an ISS=2 immediately after the accident. Several weeks later severe neck pains developed and she was unable to work for 28 weeks. During the search for a new job she was unemployed (for no longer than two weeks) and eventually rejoined the same firm on a part-time basis. She still works a shorter number of hours per week than before the accident.

A 22 year-old female pedestrian hit by a Dodge truck in Accident 106 was assigned an ISS=5 for a whiplash injury, concussion and shock sustained in the accident. She states that after the accident she was unable to cope with her previous job and the firm for whom she worked prior to the accident would not re-employ her. Consequently she was unemployed while searching

TABLE A8: LOSS OR CHANGE OF EMPLOYMENT RESULTING FROM INJURY

Accident Number	I.S.S.	Unemployed while looking for new job.	Return to Workweeks
023	17	No	40
090	2	Yes	28
106	5	Yes	16
162	13	Yes	20
206	14	No	104
212	3	Yes	1
266	1	No	Unknown
268	1	No	Unknown

for a new job. Sixteen weeks after the accident she began work in "a very part-time" position, on a lower salary and she is still working in that position.

A male car driver aged 62 years was involved in a two-car collision (Accident 162) and was assigned an ISS=13 for concussion and a dislocated left shoulder. He was unable to continue with his previous job but managed to find a new job with the same firm and began work 28 weeks after the accident. The new job involved working fewer hours and he states his gross weekly income was 25 per cent less than before the accident.

A 21 year-old female passenger was assigned an ISS=14 after being involved in a two-car collision (Accident 206). She sustained concussion, a fractured femur and injury to the right knee and left wrist in the accident, and she spent 44 days in hospital. She was replaced in her job immediately after the accident and did not work for two years after the accident but she then returned to her previous job when the position became vacant again.

A 23 year-old male car driver involved in a two-car collision (Accident 212) sustained injuries to his sternum and bruising to his central abdomen; he was assigned an ISS=3. He returned to work after one week but found that he was unable to cope and began looking for a new job seven weeks after the accident. During the search for a new job he was unemployed and as a result lost \$200 in income. The new job was for the same number of hours per week but on a lower salary than his previous job.

A 19 year-old female passenger involved in a two-car collision (Accident 266) was assigned an ISS=1 for a lacerated scalp, but a whiplash injury that was fully evident only some time after the accident caused employment difficulties.

She states she lost her job and does not expect to ever return to work but she has not given any further employment details. However in Section D of the questionnaire she states her activities within the family and community were limited for 40 weeks. In Section F she states she feels more emotionally dependent on others than before the accident.

Again it was a whiplash injury that developed in the month after the accident that caused a 39 year-old female passenger to change her job. She was involved in a two-car collision (Accident 268) and was assigned an ISS=1 for bruising and abrasions immediately after the accident. Details on the change of employment have not been given but her work and recreation capacity have been reduced by seven and a half per cent.

Twelve persons (eight per cent of the injured questionnaire respondents) were replaced in their jobs during their respective periods of recovery. Table A9 gives the details of each case. Generally replacement was made on a full-time basis within one week of the time of the accident.

The period of replacement of the injured person in the workforce varied between one and 234 weeks. This latter period is, in effect, indefinite and really corresponds to the victim losing his job. This case has been considered in the previous Section on loss or change of job, as have those persons involved in Accidents 206, 212 and 268 (2).

The two most informative remaining cases where replacement of an injured employee was necessary are Accident 160 and Accident 029.

The 21 year-old motorcyclist involved in a 'motorcycle vs. vehicle' collision (Accident 160) sustained a fractured femur, a fractured pelvis and one per cent burns

TABLE A9: REPLACEMENT OF AN INJURED EMPLOYEE

Accident	I.S.S. for Injured Employee	Replacement of Employee		
		Start - time after accident, weeks	Duration, weeks	Full-time FT/ Part-time PT
010	8	1	15	PT
016	11	2	4	FT
023	17	1	234 - indefinite	FT
029	18	1	32	FT
039	1	1	1	FT
111	13	1	6	FT
148	3	1	5	FT
160	10	1	39	FT
206	14	Not stated	104	FT
212	3	1	1	FT
268	1	1	2	PT
268(2) ¹	1	1	Unknown	FT

Note: ¹ Two persons in this category in Accident 268.

to his left arm. He spent eight and a half weeks in hospital and was replaced immediately after the accident by a full-time employee for a period of 32 weeks.

The severe injuries sustained by the 40 year-old car driver in Accident 029, a 'car vs. multi-vehicle' collision, are not reflected by his relatively fast return to work. However, the 39 weeks listed as the period before returning to work do not give evidence of the very part-time nature of the work undertaken. Many work-hours were spent in medical therapy and even five years after the accident this person is unable to work at his pre-accident capacity.

Often the numerical assessments of injury severity, residual disability and, in this particular case, time of return to work, conceal the personal hardship incurred or the additional external help and care that is required for the victim to undertake 'normal' family and work activities.

Family and Community Activities

Section D - Questions 1 and 2.

1. Were your activities within the family and/or community limited as a result of the injuries from the accident? YES / NO

If YES - were your activities limited
a little
a lot

If YES - how long was it before your activities returned to normal? weeks

2. Were the activities of your family limited as a result of the accident? YES / NO

If YES - were they limited because:

Someone had to care for you while you recovered.

Your vehicle was written-off and your family had no other private transport.

Your vehicle was damaged and not available while being repaired.

Your injuries reduced your mobility and as a result of this your family's mobility.

Another reason : please specify

If YES - how long was it before the activities of your family returned to normal? weeks

From the 150 injured respondents, 77 persons (51 per cent) answered that their own activities within the family had been limited. Of these 77 persons, 45 stated that their activities had been limited a little and 27 persons stated that their activities had been limited a lot, with five unknowns. Table A10 summarises the results.

The length of time before the victim's activities returned to normal ranged between one week and 'never'. Of those respondents stating their activities had been limited, 27 persons (37.5 per cent) had returned to a level of 'normal' activity in less than three weeks, eight persons (11.1 per cent) required more than 104 weeks and four of them did not expect to be ever capable of undertaking their original activities.

Table A11 indicates the relative importance of the various reasons for family activities to be limited as a result of the accident. From the 150 questionnaires returned by injured persons, 67 persons (44.7 per cent) stated their family's activities had been limited. The two primary causes centred on the injured persons. First, someone had to

TABLE A10: LIMITATION OF VICTIM'S ACTIVITY WITHIN THE FAMILY AND/OR COMMUNITY

Activities limited	Number of Respondents	Per cent of Respondents
No limitation	73	50.3
A little	45	31.0
A lot	27	18.6
Total	145	99.9 ¹

Note: ¹ Rounding Error

TABLE A11: CAUSES OF LIMITATION OF FAMILY ACTIVITY

Cause of limitation of family activity	Limitation of Family Activity		
	Number of Families	Number of Causes	Per cent of Causes
(1) Someone to care for injured person	10	28	30.1
(2) Vehicle written-off	11	17	18.3
(3) Vehicle damaged - in repair	11	18	19.4
(4) Reduced mobility of victim causing lower family mobility	9	24	25.8
(5) Other	1	4	4.3
(6) Unknown	2	2	2.1
(1) and (5)	1		
(1) and (4)	9		
(1) and (3)	5		
(1) and (2)	1		
(1) and (3) and (4)	1		
(1) and (2) and (4)	1		
(3) and (5)	1		
(2) and (4)	3		
(2) and (4) and (5)	1		
Total	67		100.0

take care of them and secondly the reduced mobility of the injured persons lowered, in turn, the mobility of the family as a whole. These two causes explained the reduced mobility in 55.9 per cent of the families, while the inability to use the damaged vehicle (because it was written-off or in repair) covered the reasons given by a further 37.7 per cent of the families.

Legal and Court

Section E - Questions 5 and 7.

5. Did you have to go to court as a result of your claim for damages? YES / NO

If NO - why not?

- Settled out of court
- Dropped claim for damages
- Case has not yet been heard
- Other : please specify

7. Who eventually paid these legal costs?

- You/Your parents
- Insurance company
- Workers compensation
- Trade Union
- Someone else : please specify

Only two of the respondents to the questionnaire had been to court as a result of their claim for damages. From the 40 persons who answered the question, 28 persons (70.0 per cent) had settled out of court, seven persons (17.5 per cent) were still waiting for their case to be heard and one other person had dropped his claim. Table A12 summarises the results.

As only 23 persons were able to state the exact costs of legal advice, this important cost parameter was estimated from insurance information where a larger sample was available. The questionnaire has provided some insight into the incidence of legal costs and these are summarised in Table A13.

Compensation Procedure

In this study the answers to four questions in Section E of the questionnaire have been summarised to give some insight into the intangible costs of the delays in compensation. These results should not be interpreted as definitive as the sample size is small but further research on the appraisal of various third party compensation schemes and their associated monetary and non-monetary costs is fully endorsed.

TABLE A12: OCCURRENCE OF COURT APPEARANCE IN CLAIM FOR DAMAGES

Court Appearance	Respondents with claim for damages	
	Number	Per cent
Yes - appeared in court	2	5.0
Settled - out of court	28	70.0
Dropped claim	1	2.5
Case not yet heard	7	17.5
Other	2	5.0
Total	40	100.0

TABLE A13: LEGAL COSTS - SOURCE OF FUNDS

Legal Costs - Source of Funds	Respondents with legal costs	
	Number	Per cent
You/Your parents	11	33.3
Insurance company	21	63.7
Workers compensation	1	3.0
Trade Union	0	0
Someone else	0	0
Total	33	100.00

Section E - Questions 9, 11, 12 and 14.

9. Did your compensation cover all your medical and legal expenses? YES / NO

If NO - what did you have to pay for? (Include any payment that you have so far not been compensated for)
 medical and hospital attention \$.....
 for ambulance services \$.....
 for legal costs (if any) \$.....

11. Was the total payment you received or expect to receive more than/about the same as/less than, what immediately after the accident, you expected to receive? (circle correct answer)

12. How long did it/will it take between your application and your receipt of any compensation? weeks

14. During the period after the accident did expenses or income lost as a result of the accident cause any of the following financial problems? (you may tick more than one box)

- Sale of major assets such as car or house
- Return of goods purchased on hire purchase
- Decrease in savings
- Lower than 'normal' expenditure on clothing, household items or food
- Increased borrowing or debt
- Other : please specify

If borrowing was required, from which of the following did you borrow?

- Bank
- Credit union
- Trade union
- Finance company
- Family/relatives/friends
- Other : please specify

From the 37 persons answering the question on compensation covering medical and legal expenses, 33 persons (89.2 per cent) stated that the compensation amount had covered all medical and legal expenses. Table A14 summarises the results and shows the amounts that had to be paid by the victim in the four cases where the full costs were not covered by the third party insurance.

Table A15 gives the percentage of respondents who received compensation awards greater than, less than or equal to the amount expected. Table A16 presents the percentage of respondents by the period of settlement of third party insurance claims.

Those persons with third party insurance claims still outstanding and those who received a lesser amount than expected are probably more inclined to complete and return the Cost of Accident questionnaire as it provides an outlet for their grievances. In this sense, the percentages of respondents with a lower compensation amount than expected or with outstanding claims may be greater than the population total.

Table A17 gives some insight into the frequency of financial problems caused as a result of the accident. As there is no record of the dollar amounts involved it is impossible to aggregate the effects

in monetary terms but some concept of significant reductions in expenditure or of increased debt can be found from the Table.

Ambulance Costs

Section E - Question 18.

18. As a result of the accident, did you require ambulance services? YES / NO

If YES - what was the cost of these services? \$.....

- were you a subscriber to an ambulance fund? YES / NO

- who has or will eventually pay the cost of these services?

- Ambulance fund
- You/your parents
- Insurance company
- Other : please specify

From the 150 injured persons responding to the questionnaire, 88 persons (58.7 per cent) stated they had required ambulance services after the accident. Only 42 persons were able to estimate the exact cost of the service and these costs ranged from a minimum of \$9.00 to a maximum of \$52.00. All the estimates below \$28.50 (the fixed charge for the ambulance) were possible only when more than one injured person shared the ambulance. This was most likely when a sitting patient accompanied a stretcher patient or in several cases where two children were carried together.

There were 30 persons who stated they were subscribers to the St. John Ambulance Scheme and 88 persons gave information on the incidence of costs as summarised in Table A18.

Pain and Suffering

Section E - Questions 15, 21, 22;
 Section F - Question 2.

E15. After the accident but before you returned to your normal activity (work, home duties, etc.)...

F2. After the accident but before the accident victim returned to his/her normal activity ...

- a. Did you or do you have greater difficulty sleeping than before the accident? YES / NO
- b. Did you or do you take more sleeping or sedative drugs than before the accident? YES / NO
- c. Did you or do you drink more alcohol than before the accident? YES / NO
- d. Did you or do you smoke more tobacco than before the accident? YES / NO
- e. Did you or do you feel you were/are under a greater strain than before the accident? YES / NO
- f. Were you or are you often depressed without apparent reason? YES / NO
- g. Did you or do you experience more problems in relationships than before the accident? YES / NO

E21. Did you or do you feel more emotionally dependent on others than before the accident? YES / NO

If YES - did you/do you/will you feel less emotionally dependent after recovery from the accident?

TABLE A14: COMPENSATION FOR MEDICAL AND LEGAL EXPENSES

Compensation	Respondents to Question		Amounts Remaining to be Paid		
	Number	Per cent	Hospital and Medical	Ambulance	Legal
Did cover all medical and legal expenses	33	89.2			
Did not cover all medical and legal expenses	4	10.8	\$ 11 \$ 30 \$ 44 \$1,000	\$25 \$34 \$30	\$ 7 \$ 300 \$ 350 \$1,000
Total	37	100.0			

TABLE A15: THIRD PARTY INSURANCE COMPENSATION - GREATER, LESS THAN OR EQUAL TO THE AMOUNT EXPECTED

Compensation Award	Respondents to Question	
	Number	Per cent
Greater than expected	4	10.8
Less than expected	14	37.8
Equal to expected	19	51.4
Total	37	100.0

TABLE A16: PERIOD OF SETTLEMENT OF THIRD PARTY INSURANCE CLAIMS

Period to Settlement	Number of Persons	% of Respondents to Questions
< 1 month	3	5.2
1 month < 6 months	11	19.0
6 months < 1 year	5	8.6
1 year < 2 years	7	12.1
2 years < 3 years	4	6.9
3 years < 4 years	5	8.6
> 4 years	3	5.2
Unsettled	20	34.5
Total	58	100.1 ¹

Note: ¹ Rounding Error

TABLE A17: OCCURRENCE OF FINANCIAL PROBLEMS AFTER THE ACCIDENT

Financial Problems	Financial Problems after the Accidents		
	Number of Respondents	Number of Problems	Per cent of Causes
(1) Sale of major assets such as car or house		3	3.4
(2) Return of goods purchased on hire purchase		1	1.1
(3) Decrease in savings	10	34	38.2
(4) Lower than 'normal' expenditure on clothing, household items or food.	2	22	24.7
(5) Increased borrowing or debt	7	20	22.5
(6) Other : Please specify	4	9	10.1
(5) and (6)	1		
(4) and (6)	2		
(4) and (5)	1		
(3) and (6)	2		
(3) and (5)	3		
(3) and (4)	11		
(3) and (4) and (5)	5		
(2) and (3) and (5)	1		
(1) and (5)	1		
(1) and (3)	1		
(1) and (3) and (4) and (5)	1		
Total	52	89	100.0

TABLE A18: AMBULANCE SERVICES - SOURCE OF FUNDS

Ambulance Services Source of Funds	Respondents Using Ambulance Service	
	Number	Per cent
Ambulance Fund	21	23.9
You/Your parents	24	27.3
Insurance Company	33	37.5
Other	10	11.4
Total	88	100.1¹

Note: ¹ Rounding Error

E22. Were you permanently disabled in any way
as a result of the accident? YES / NO

There are three questions in the questionnaire that can give some insight into the suffering experienced by the victims and their families as a result of the accident.

From the 150 injured persons returning the questionnaire, 82 persons (54.7 per cent) answered positively to having experienced at least one of the above consequences: difficulty sleeping, more sedatives, more alcohol, tobacco, strain, depression or problems in relationships. From this group of respondents 32 persons (21.3 per cent) stated they had suffered three or more of these consequences.

In answer to the same question, from the point of view of 'other' members of the family, 45 persons (who had lived with the victims after the accident) stated they had suffered at least one consequence and of those, 22 persons had suffered three or more of the listed consequences.

These post-accident consequences are symptomatic of the pain experienced by the victims and the grief and suffering of those persons close to the victims. These statistics do not indicate the severity or the duration of the emotional disturbance but they do give some insight into the frequency and effects of such trauma.

Eighteen persons (12 per cent of the injured respondents) stated they felt more emotionally dependent on others after the accident. However of these persons, five believed that after recovering fully they were less emotionally dependent and ten

persons thought they were possibly less dependent, but three persons stated they were no less dependent on others emotionally even after recovery from the accident.

In this study 21 persons (14 per cent of the injured questionnaire respondents) stated they had some form of permanent disability. Such disabilities varied in degree from a mild backache to one case of permanent impairment of intellectual capacity, subtle emotional change and the loss of co-ordination in the left upper leg. A car passenger lost the sight of his right eye and other residual effects including a 15 per cent loss in full working capacity, a seven and a half per cent loss in work and recreation capacity, varying degrees of loss in leg and arm function, scarring and an effective loss of a third of kidney function.

From the insurance information made available we were able to find 49 persons who stated that they had some form of residual disability. This represents five per cent of all the participants involved in the case-study accidents but it is an under-estimate of the true percentage of participants with a permanent impairment as many severely injured persons were ineligible for third party compensation.

Any degree of permanent disability requires time, patience, effort and usually money to achieve a satisfactory level of adjustment to a modified way of life. Those persons with residual disabilities have usually stated that no amount of money could compensate them, and the dollar estimates for pain and suffering used in this study should be regarded as minimum average values.

APPENDIX B

PRICE INDICES 1976 - 1980

Cost Parameter	Price Index	% Increase 1976 - 1980
Foregone Productive Contribution	Average Weekly Earnings in all jobs - weighted average of males (58.6%) and females (41.4%) earnings ¹	44.85
Family and Community Losses	As above ¹	44.85
Ambulance Costs	Average Weekly Earnings - transport and communication male employees. ¹	47.37
Hospital Costs	Social Cost per Bed per Day ²	30.76
Medical Costs	Medical Care Charges - weighted average of several services. ³	47.40
Motor Vehicle Damage	Average Weekly Earnings - trades, production and process male employees ¹	45.16
External Property Damage	As above ¹	45.16
Legal and Court Costs	Average Weekly Earnings - professional and technical employees - weighted average of male (70.0%) and female (30.0%) earnings ¹	39.48
Police Investigation	First Class Constable Salary ⁴	44.44
Towing Costs	Towing Costs ⁵	50.00
Miscellaneous Costs	Motor Vehicle Operation ⁶	52.40
Insurance Administration	Average Weekly Earnings - administrative, executive and managerial employees - weighted average male (50%) and female (50%) earnings ⁷	32.99
Pain and Suffering	C.P.I. ⁷	46.62

Notes: ¹ Australian Bureau of Statistics: Weekly Earnings of Employees (Distribution) Australia 1980 (63100).

² Unpublished estimates from an Adelaide major public hospital.

³ Commonwealth Department of Health.

⁴ South Australian Police Department.

⁵ South Australian Automobile Chamber of Commerce - recommended towing costs.

⁶ Australian Bureau of Statistics: Motor Vehicle Operation - Adelaide (6401.0) Unpublished. Includes petrol, tyres, tubes, parts, repairs, motor vehicle insurance, registration, drivers licence, motoring organisation fees. Sept.1976-Sept.1980.

⁷ Australian Bureau of Statistics: Consumer Price Index Sept.Qtr. 1980. (6401.0)

CONFIDENTIAL

FOR RESEARCH PURPOSES ONLY

**ROAD ACCIDENT RESEARCH UNIT
THE UNIVERSITY OF ADELAIDE**

**Questionnaire
on
THE COST OF
ROAD ACCIDENTS**

THE FOLLOWING INFORMATION ON THIS PAGE WILL BE DESTROYED
WHEN OUR PROCESSING HAS BEEN COMPLETED.

Reference: Accident on / / investigated by the Road Accident Research
Unit of the University of Adelaide.

Name:

Address:

Telephone No.:

All questions refer to the accident that occurred on / / . Please answer the questions as you would have at the time of the accident.

SECTION A — TREATMENT FOR INJURIES AFTER THE ACCIDENT

We would like to know if you saw a doctor or received treatment for your injuries outside of a hospital. This does not include outpatient visits.

1. Did you see a doctor(s) other than at a hospital for treatment of conditions related to the accident? YES / NO
 If YES — how many times did you see the doctor(s)?

2. Did the doctor(s) order any medication (that is, prescriptions) for you? YES / NO
 If YES — how many prescriptions, including repeats?

3. What was the total cost to date of all doctors visits (outside hospital) relating to your accident injuries including X-rays, tests, etc.? \$

4. Who eventually paid for the doctor's bills? Please tick correct box(es)
 - Insurance company: name of company
 - Medical health fund: name of fund
 - Workers compensation: name of company
 - You/your parents
 - Someone else: please specify
 - Not paid

5. As a result of the accident did you have any other treatment (outside hospital) eg: from dentist, physiotherapist, chiropractor, occupational therapist or other? YES / NO
 If YES — for which injury?
 — which service?
 - Dentist — how many visits?
 - Physiotherapist — how many visits?
 - Chiropractor — how many visits?
 - Occupational therapist — how many visits?
 - Psychiatrist — how many visits?
 - Other: please specify

6. What was the total cost of this 'other' treatment for injuries? \$

7. Who eventually paid the bill for this 'other' treatment? Please tick the correct box(es)

- Insurance company: name of company
- Medical health fund: name of fund
- Workers compensation: name of company
- You/your parents
- Someone else: please specify
- Not paid

8. Are you still being treated for your injuries? YES / NO

If NO — please go straight to Section B below.

If YES — what is the cost of this treatment each week? \$

9. Who do you expect to pay for this treatment?

- Insurance company
- Medical health fund
- Workers compensation
- You/your parents
- Someone else: please specify
- Free treatment

SECTION B — COST OF CARE AFTER THE ACCIDENT

In this section we are interested in the cost of care you received after the accident other than in hospital (for example home nursing or care at a special home) and excluding treatment covered in Section A.

1. Straight after the accident where did you go? Please tick the correct box.

- Hospital — treated at casualty and allowed to go home (go to Question 3)
- Hospital — stayed in hospital (go to Question 2)
- Home — injured (go to Question 3)
- Continued journey — not injured (go to Section C — Question 1)
- Other: please specify
..... (go to Question 3)

2. If you stayed in hospital — when you finally left hospital where did you go?
- Another hospital — for how long were you there?weeks
- Nursing home — for how long were you there?weeks
- Your own home
- Other: please specify
3. When you arrived home did you need any extra looking after? YES / NO
- If NO — please go straight to page 4, Section C.
4. When you arrived home who looked after you? Please tick correct box(es)
- Member of your family (including relatives) who usually lived with you at the time of the accident
- Member of your family (including relatives) who did not usually live with you at the time of the accident
- Neighbour
- Home nurse who was paid
- Other: please specify
5. How many weeks did the above person spend looking after you?weeks
6. If you received any care (do not include treatment included in Section A) after you left hospital what was the cost of this care? \$
- Who eventually paid for it?
- Insurance company: name of company
- Medical health fund: name of fund
- Workers compensation
- You/your parents
- Someone else: please specify
7. Are you still being cared for because of your injuries? YES / NO
- If NO — please go to Question 9.
- If YES — what is the cost of this care each week? \$
8. Who do you expect to pay for this?
- Insurance company
- Medical health fund
- Workers compensation
- You/your parents
- Someone else: please specify

9. If you did not employ a home nurse: If compensation money had been available to you at that time, would you have employed a home nurse? YES / NO

SECTION C – EDUCATION AND EMPLOYMENT

1. What is your date of birth?/...../.....
2. In which country were you born?
3. What was your occupation at the time of the accident?
- If retired or unemployed please state former occupation
4. If you were a student or in a training course at the time of the accident at which level were you studying? If you were not a student at the time what level did you reach in your education?
 - Postgraduate
 - University
 - Other tertiary education
 - Training after high school: please specify
 - Matriculation
 - High school (not matriculation)
 - Primary school
 - Preschool
 - No formal education
 - Other: please specify
5. What was your gross income at the time of the accident? Please tick the appropriate box.
 - Under \$4000 (under \$77 per week)
 - \$4000–\$7999 (\$77 and under \$154 per week)
 - \$8000–\$11999 (\$154 and under \$231 per week)
 - \$12000 or more (\$231 or more per week)

6. At the time of the accident what was your major activity? Please tick the correct box.
- Retired on superannuation (please go to page , Section D)
 - Retired on a pension (please go to page 8, Section D)
 - Unemployed (please answer Questions 30 & 31 and then go to Section D)
 - Student (please answer Questions 28 & 29 and then go to Section D)
 - Home duties (please answer Questions 25 to 27 and then go to Section D)
 - Home duties and part time work (please answer Questions 7 to 24 for your part time work and Questions 25 to 27 for your home duties)
 - Paid job/self employed (please answer Questions 7 to 24 and then go to Section D)
 - Other: please specify
(please go to page 8 , Section D)

If you were occupied in a paid job or were self employed at the time of the accident please answer Questions 7 to 24

7. At the time of the accident what was your expected age of retirement?
8. At the time of the accident did you expect to change your job in the then foreseeable future? YES / NO
9. Did the injuries received in the accident reduce your chance of promotion or of increasing the size of your business?
- No
 - Possibly — but not very much
 - Yes
10. Did the injuries you received in the accident cause you to lose your job or change your job? YES / NO
- If NO — please go straight to Question 17
If YES — please continue with the questions.
11. If you have not returned to work, do you expect to ever return to work? YES / NO
- If NO — please go straight to page 8 , Section D.
12. How long after the accident did you start looking for a job?weeks
13. Were you out of work while looking for a new job? YES / NO
14. Have you found a new job? YES / NO
- If NO — please go straight to Question 22
If YES — please continue with the questions.

-
15. Was your new job with the same firm? YES / NO
16. Was your new job on a higher/lower/same wage than before the accident? (please circle the correct answer)
17. How many weeks after the accident did you start work?weeks
18. On your return to work did you work the same number of hours as you had previously done? YES / NO
If NO — did you work longer/shorter hours?
(please circle correct answer)
19. For how many weeks did you work this different number of hours?weeks
20. What was the difference in your gross weekly income as a result of working this different number of hours? \$
21. Did you lose income as a result of being absent from work? YES / NO
How much income did you lose? \$
22. Did the injuries received in the accident make you consider retiring earlier? YES / NO
If YES — at what age?
23. Was anyone employed to do your job while you were recovering? YES / NO
If YES — please state how soon after the accident they were first employed
— please state for how long they were employed to do your job
— please state if they were employed part time or full time to do your job
24. Was anyone put off work as a result of your absence? YES / NO
If YES — how many people?
— what sort of jobs did they do?
.....
— for how long were they put off work?

If you were occupied in home duties at the time of the accident please answer Questions 25 to 27

25. Did the injuries you received in the accident reduce the time that you were able to work at this activity? YES / NO
- If NO — please go to page 8, Section D
 If YES — for how long after the accident were you unable to do your normal work?weeks
 — did anyone else help you with this work?
 (Please tick correct box(es).)
- A member of your family (including relatives) who usually lived with you at the time of the accident.
- A member of your family (including relatives) who did not usually live with you at the time of the accident.
- Neighbour
- Employed someone: please specify
- Someone else: please specify
- No one helped.
26. If someone was employed to help you in the home — for how long were they employed?
- What was the cost of employing them? \$
27. If you did not employ some help: If compensation money had been available to you at the time would you have employed some help during this period? YES / NO

Now go to page 8, Section D

If you were occupied as a student at the time of the accident please answer Questions 28 and 29

28. Did your injuries stop you from studying? YES / NO
 If YES — for how long?
29. Did your injuries stop you from eventually getting the job you wanted before the accident (or are they likely to stop you from getting the job you wanted)?
- Yes
- Possibly
- NO

Now go to Section D.

If you were occupied in home duties at the time of the accident please answer Questions 25 to 27

30. Did your injuries stop you from looking for a job? YES / NO
 If YES — for how long were you unable to look?weeks

31. Did your injuries mean you could not work as well as you could before the accident? YES / NO
 If YES — how long was it before you could work normally again?weeks

SECTION D — THE EFFECT OF THE ACCIDENT ON THE INJURED PERSON, THE INJURED PERSON'S FAMILY OR COMMUNITY ACTIVITIES

1. Were your activities within the family and/or community limited as a result of the injuries from the accident? YES / NO
 If YES — were your activities limited
 a little
 a lot
 If YES — how long was it before your activities returned to normal?weeks

2. Were the activities of your family limited as a result of the accident? YES / NO
 If YES — were they limited because:
 Someone had to care for you while you recovered
 Your vehicle was written-off and your family had no other private transport
 Your vehicle was damaged and not available while being repaired
 Your injuries reduced your mobility and as a result of this your family's mobility
 Another reason: please specify:

 If YES — how long was it before the activities of your family returned to normal?weeks

3. Did members of your family or friends lose income as a result of hospital visits, nursing you or doing jobs you previously did? YES / NO
 If YES — please state gross income lost per week by family \$
 — and the number of weeks in which income was lostweeks
 — please state gross income lost per week by friends \$
 — and the number of weeks in which income was lostweeks

4. Did members of your family or friends have to take time off from school as a result of hospital visits, nursing you or doing jobs you previously did? YES / NO

If YES — please state the average number of hours lost per week
 — and the number of weeks in which time was lostweeks

5. Please write in the type of transport that your family used to visit you in hospital or nursing home or while recovering elsewhere

Type of Transport	Total Length of Journey for Visit	No. of Visits
Hospital		
Nursing Home		
Other		

6. Please write in the type of transport you used for your visits to outpatients or to the doctors.

Type of Transport	Total Length of Journey for Visit	No. of Visits
Outpatients visits		
Doctors visits		
Other		

7. Did you receive any financial support or a pension from the Government as a result of the accident? YES / NO

If YES — which support or pension was it?

- Sickness benefit
 Sickness benefit then invalid pension
 Unemployment benefit
 Other: please specify.....
 — how long was this support or pension received?weeks

8. Did any other member of your family receive any financial support or pension from the Government as a result of the accident? YES/ NO

If YES — which support or pension was it?

- Special benefits
 - Unemployment benefits
 - Other: please specify
- how long was this support or pension received?weeks

SECTION E — COMPENSATION AND ADVICE AFTER THE ACCIDENT

Compensation does not include any money received from the Government in the form of sickness, invalid or unemployment benefits.

1. Immediately after the accident did you expect to receive compensation for any injuries you received in the accident? YES/ NO

2. Following the accident were you advised by a lawyer? YES/ NO

If NO — please go straight to page 11, Question 4

If YES — what advice did you receive about the things listed below? Please tick all items which apply.

(i) Government benefits:

- the lawyer gave you no advice about Government benefits
- told you to contact the Department of Social Security
- told you to apply for a specific benefit
- helped you fill out the form
- Other: please specify

(ii) Return to work:

- the lawyer gave you no advice about returning to work
- told you to return to work as soon as possible
- told you to delay returning to work
- told you not to return to work until the claim was settled
- told you to work part-time until the claim was settled
- Other: please specify

(iii) Liability and damages:

- the lawyer gave you no advice about the probable outcome of the case
- told you whether you were likely to receive damages but not how much
- told you whether you were likely to receive damages and how much
- told you when you were likely to receive payment
- told you not to make or proceed with a claim for damages
- Other: please specify

(iv) Out of court settlement:

- the lawyer initially gave you no advice about an out of court settlement
- told you an out of court settlement was likely
- told you to accept any out of court settlement offered
- told you an acceptable out of court settlement was unlikely
- Other: please specify

3. Where was the lawyer who gave you the advice referred to in Question 2 from ?

- Your insurance company
- Your trade union
- Somebody else's insurance company
- A law firm you employed
- Legal aid
- Other: please specify

4. Did you and/or your lawyer apply for compensation for injuries you received in the accident? YES/ NO

If NO — please go straight to Question 14 on page 13.
If YES — which of the following did you apply for ?

- Workers compensation: name of company
- Third party motor vehicle insurance: name of company
- Personal insurance: name of company
- Other: please specify (include name of company)

5. Did you have to go to court as a result of your claim for damages? YES / NO

If NO — why not?

- Settled out of court
- Dropped claim for damages
- Case has not yet been heard
- Other: please specify

6. If legal costs have been paid please state the total legal costs that had to be paid in relation to this accident? \$

7. Who eventually paid these legal costs? Please tick appropriate box.

- You/your parents
- Insurance company
- Workers compensation
- Trade union
- Someone else: please specify

8. How much compensation have you received from each of the following sources? (Exclude payments for legal and medical expenses)

- Workers compensation \$
- Third party motor vehicle insurance \$
- Personal accident and sickness insurance \$
- Other: please specify
- \$

9. Did your compensation cover all your medical and legal expenses? YES / NO

If NO — what did you have to pay for? (Include any payment that you have so far not been compensated for)

- medical and hospital attention \$
- for ambulance services \$
- for legal costs (if any) \$

10. Are you still waiting for payment or further payments? YES / NO

If YES — how much (other than amounts included in Question 8) do you expect from each of the following sources?

- Workers compensation \$
- Third party motor vehicle insurance \$
- Personal accident and sickness insurance \$
- Other: please specify
..... \$

11. Was the total payment you received or expect to receive more than/about the same as/less than, what immediately after the accident, you expected to receive? (circle correct answer)

12. How long did it/will it take between your application and your receipt of any compensation?weeks

13. Did you/do you feel confident during this period of eventually receiving compensation? YES / NO

14. During the period after the accident did expenses or income lost as a result of the accident cause any of the following financial problems? (You may tick more than one box).

- Sale of major assets such as car or house
- Return of goods purchased on hire purchase
- Decrease in savings
- Lower than 'normal' expenditure on clothing, household items or food
- Increased borrowing or debt
- Other: please specify
.....

If borrowing was required, from which of the following did you borrow?

- Bank
- Credit union
- Trade union
- Finance company
- Family/relatives/friends
- Other: please specify

15. After the accident but before you returned to your normal activity (work, home duties, etc.):
- (a) Did you or do you have greater difficulty sleeping than before the accident? YES / NO
 - (b) Did you or do you take more sleeping or sedative drugs of any kind than before the accident? YES / NO
 - (c) Did you or do you drink more alcohol than before the accident? YES / NO
 - (d) Did you or do you smoke more tobacco than before the accident? YES / NO
 - (e) Did you or do you feel you were/are under a greater mental strain after the accident than before? YES / NO
 - (f) Were you or are you often depressed without apparent reason? YES / NO
 - (g) Did you or do you experience more problems in relationships than before the accident? YES / NO

If YES to part (g) above — please tick the appropriate box(es).

- with own children?
- with grandchildren?
- with wife/husband?
- with father/mother?
- with neighbours?
- with friends?
- with boss?
- with work mates?

16. Did you or do you think your recovery was/is prolonged due to any worry over compensation? YES / NO

17. Were you covered by a health fund at the time of the accident? YES / NO

If YES — please state name of health fund

— which hospital and medical tables?

— did you claim your medical and hospital costs from the health fund? YES / NO

18. As a result of the accident, did you require ambulance services? YES / NO
 If YES — what was the cost of these services? \$
- were you a subscriber to an ambulance fund? YES / NO
 — who has or will eventually pay the cost of these services? (tick the correct box)
- Ambulance fund
 You/your parents
 Insurance company
 Other: please specify
19. Was there any form of compensation available to you that you decided not to accept? YES / NO
 If YES — please specify the compensation
20. Did you receive job retraining after the accident? YES / NO
 If YES — please specify
- how did you/do you feel about having to retrain? RESENTFUL
 (circle correct response) INDIFFERENT
 PLEASED
21. Did you or do you feel more emotionally dependent on others than before the accident? YES / NO
 If YES — did you/do you/will you feel less emotionally dependent after recovery from the accident? YES
 POSSIBLY
 NO
22. Were you permanently disabled in any way as a result of the accident? YES / NO
 If NO — go straight to Question 26
 If YES — please specify
23. Before compensation how did you feel about being disabled?
 Please describe briefly:

24. Was/is your feeling about the disability affected by your uncertainty about compensation? YES
 POSSIBLY
 NO

25. Did you/do you feel different about your disability after compensation? YES / NO

If YES— how? Please describe briefly

.....

26. Marital status? (please tick correct box[es].)

	<i>Before Accident</i>	<i>After Accident</i>
Married/De Facto	<input type="checkbox"/>	<input type="checkbox"/>
Divorced	<input type="checkbox"/>	<input type="checkbox"/>
Separated	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Single	<input type="checkbox"/>	<input type="checkbox"/>
Widowed	<input type="checkbox"/>	<input type="checkbox"/>

SECTION F — ATTITUDES OF OTHER MEMBERS OF HOUSEHOLD

This section is to be answered by a member of the household who was not involved in the accident.

1. What is your relationship to the accident victim?
(Please tick appropriate category)
 - Spouse/De Facto
 - Child
 - Parent
 - Other relative
 - Friend

2. After the accident but before the accident victim returned to his/her normal activity:
 - (a) Did you or do you have greater difficulty sleeping than before the accident? YES / NO
 - (b) Did you or do you take more sleeping or sedative drugs of any kind than before the accident? YES / NO
 - (c) Did you or do you drink more alcohol than before the accident? YES / NO
 - (d) Did you or do you smoke more tobacco than before the accident? YES / NO
 - (e) Did you or do you feel you were/are under a greater mental strain after the accident than before? YES / NO
 - (f) Were you or are you often depressed without apparent reason? YES / NO
 - (g) Did you or do you experience more problems in relationships than before the accident? YES / NO

If YES to part (g) — please tick the appropriate answer(s)

- with own children?
- with wife/husband?
- with father/mother?
- with neighbours?
- with friends?
- with boss?
- with work mates?

3. Did you or do you think the accident victim's recovery was/is prolonged due to any worry over compensation? YES / NO

4. Do you think those in the household were under more stress than normal during the period between the accident and the accident victim's return to normal activity? YES / NO

5. Were the activities of those in your household limited as a result of the accident? YES / NO

If YES — were they limited because:

- Someone had to care for the accident victim while he/she recovered
- The vehicle was written-off and your household had no other private transport
- The vehicle was damaged and not available while being repaired
- Injuries reduced the mobility of the accident victim and this limited the mobility of members of the household
- Another reason: please specify

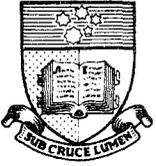
.....

COMPREHENSIVE INSURANCE OF THE VEHICLE

The following questions relate to the owner of the vehicle involved in the accident. If you were the driver but not the owner we would appreciate any effort you could make to contact the owners for answers to these questions.

1. What was your vehicle worth before the accident? \$
2. Was it covered by comprehensive insurance? YES / NO
If YES — which insurance company
3. What was the total cost of damage to your vehicle as a result of the accident? \$
4. Was your vehicle written-off? YES / NO
5. If your vehicle was a write-off what did the insurance company (if any) pay you for it? \$
6. If your vehicle was not a write-off was it repaired? YES / NO
If YES — Please state total cost of repair — specifying labour and parts-costs if possible.

Parts Costs	\$
Labour Costs	\$
Total Cost of Repair	\$
7. Was the total cost covered by any comprehensive insurance? YES / NO
If NO — Why wasn't the claim (or part of the claim) paid?
.....
— What amount did you have to pay yourself? \$
8. Did you have a No-Claim bonus before the accident? YES / NO
If YES — Did you lose any or all of this bonus because of the accident? YES / NO
If YES — How much more did you have to pay for your insurance because of the loss of your no-claim bonus? \$
9. Did you have insurance against any third party property damage? YES / NO



The University of Adelaide

ADELAIDE,

SOUTH AUSTRALIA 5001

Tel. (08) - 223 4333

Ext. 2889

ROAD ACCIDENT RESEARCH UNIT
Director - Dr. A. J. McLean

In reply please quote: 80/101 (CS)

July 1, 1980.

Dear Sir/Madam,

The University of Adelaide Road Accident Research Unit is now conducting a 'follow-up' survey on all the accidents that were investigated during 1976-1977.

The information you gave us at that time, concerning your accident has been very helpful and beneficial - thank you. Now we are asking for some further help.

Your accident was four years ago and we can appreciate that this subject may be unpleasant and understand the difficulties involved in recalling the facts from an accident that happened so long ago. However, you are the only person who can give us the information we need and your participation is very important to us.

We would be grateful if you would try to fill in this questionnaire. If there are questions you cannot answer exactly, please answer these questions to the best of your ability. All answers are treated as confidential, no personal identification is entered into our data files and only summary statistics will be reported.

Please return the questionnaire by attaching the enclosed reply-paid sticker to an envelope and the University will then pay for postage when the questionnaire is received. If the questionnaire has not been returned within three weeks, we hope you will not mind if we contact you to see if there are any questions where we might be of assistance.

If you have any problems please feel free to ring Carolyn Somerville, phone 223 4333 extension 2889. Thank you for your help.

Yours sincerely,

Carolyn J. Somerville.
Economist



The University of Adelaide

ROAD ACCIDENT RESEARCH UNIT
Director – Dr. A. J. McLean

ADELAIDE,
SOUTH AUSTRALIA 5001
Tel. (08) – 223 4333
Ext. 2889

In reply please quote:

September 17, 1980

Dear

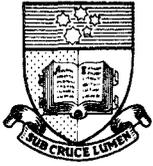
Recently we sent you a questionnaire on the "Cost of Road Accidents". As yet we have not received a reply and I am writing to inquire whether you are having any difficulty completing it. Should you be having problems please do not hesitate to contact me on 223 4333, extension 2889.

While I must stress that you are under no obligation to complete and return the form, your reply would be of great value to us. Our research requires that we know some of the problems facing motor accident victims so that we may propose means of alleviating them in the future.

I look forward to hearing from you in the near future and thank you for your co-operation.

Yours sincerely,

Carolyn Somerville.



The University of Adelaide

ROAD ACCIDENT RESEARCH UNIT
Director - Dr. A. J. McLean

ADELAIDE,
SOUTH AUSTRALIA 5001
Tel. (08) - 223 4333
Ext. 2889

In reply please quote:

Dear

Thank you for completing and returning the
Cost of Accident questionnaire.

The information you have given us will be
most valuable in our study. Thank you.

Yours sincerely,

Carolyn Somerville,
Economist.

