



Research Paper

## Socioeconomic Costs Of Road Traffic Injury Among Victims In Selected Hospitals In Southern Ethiopia

Bealu Tukela,<sup>1</sup> Teshale Shode<sup>2</sup> and Awoke Amzaye<sup>3</sup>

<sup>1</sup>Ass.Prof, in Department of Economics, Hawassa University, Hawassa, Ethiopia.

<sup>2</sup>Ass.Prof. in marketing department, Hawassa University, Ethiopia

<sup>3</sup>Ass.prof. in College of Social Sciences and humanities, Hawassa University, Ethiopia

<sup>1</sup>Corresponding Author: - Bealu Tukela.

### ABSTRACT

Road traffic injury (RTA) is not only threatening the society but also the economy of the countries, especially Ethiopia is facing the economic losses; It is ruining the lives of many, developing the social dependencies and innumerable evils. As such, the objective of this paper was intended to study socioeconomic costs of road traffic injury among victims in terms of personal costs, property damages, insurance and court administration services costs in selected hospitals in Southern Ethiopia. A sampling technique was used to select 423 injured victims which were interviewed using structured questionnaire. Gross output and indirect cost estimation method were employed to analyze the data. This study showed that costs of causality were fatal about 76 %, serious injury about 14 % and slight injury about 10%. These costs therefore have to be considered in designing strategies aimed at improving the road traffic accident.

**KEY WORDS:** Injury, Road Traffic accident, Willingness to pay rural.

Received 28 April, 2021; Revised: 10 May, 2021; Accepted 12 May, 2021 © The author(s) 2021.

Published with open access at [www.questjournals.org](http://www.questjournals.org)

### I. INTRODUCTION

Developing countries bear the brunt of the fatalities and disabilities from road traffic crashes, accounting for more than 85% of the world's road fatalities. Road traffic injuries are a global problem affecting all sectors of society (Mohammad, 2015, WHO, 2011). In the year 2020, road traffic injuries are projected to become the 3rd largest cause of disabilities in the world. The problem is increasing in these countries at a fast rate, while it is declining in all industrialized nations. The annual cost of road crashes is in excess of US \$500 billion, and in the developing world the estimated cost is about US \$65 billion each year. Due to the scarcity of costing data for African countries, it is difficult to make a precise cost of road crashes in Sub-Saharan Africa. The current estimate of costs of crashes in the continent is US\$ 3.7 billion per year, of which South Africa alone accounts for 2 billion. However, the estimated costs as a percentage of the national Gross National Product (GNP) in most African countries range from about 0.8% in Ethiopia and 1% in South Africa to 2.3% in Zambia and 2.7% in Botswana to almost 5% in Kenya (Fanueal, 2006, WHO, 2011).

A recent World Bank Global Road Safety Project (GRSP) study shows that about 10 per cent of global road deaths in 1999 took place in Sub-Saharan Africa where only 4 per cent of global vehicles are registered. Conversely, in the entire developed world, with 60 per cent of all globally registered vehicles, only 14 per cent of road deaths occurred. According to this GRSP study, the adjusted true estimate of total road deaths for all Sub-Saharan African countries for the year 2000, based on the police department's records, ranges between 68,500 and 82,200. However, the estimated fatality figure of 190,191 for Sub-Saharan Africa presented in the 2004 World Report, based on health care data, is much higher, and reflects the magnitude of under-reporting in police statistics (Mohammad, 2015, Fanuel, 2006, WHO, 2011). To date, road safety has received insufficient attention at the national and regional levels. This has resulted in part from: a lack of information on the magnitude of the problem and its preventability; a fatalistic approach to road crashes; and a lack of the political responsibility and multidisciplinary collaboration needed to tackle it effectively. However, much can be done to reduce the problem of road crashes (Fanueal, 2006).

Among transportation accidents, road accidents are generally given less public attention. Road accidents tend to be less dramatic because of their frequent occurrence, compared to, for example, air transport

accidents which occur rather infrequently but usually result in many deaths. Consequently, the large-scale economic and social impact may not be so much appreciated. Therefore, this study was intended to study socioeconomic costs of road traffic injury among victims in terms of personal costs, property damages, insurance and court administration services costs in selected hospitals in Southern Region, Ethiopia.

## II. MATERIALS AND METHODS

### 2.1. Description of study area

The study was conducted at Hawassa university comprehensive specialized hospital, Yirgalem general hospital, Dilla Referral hospital, Shashemene Referral hospital and Soddo Christian hospital. Most of these hospitals are on the route through which the main road from Addis Ababa to Moyale passes, and where different modes of transportation are being used including motor cycles and animal pulled carts.

Hawassa University Comprehensive Specialized Hospital is a teaching Hospital for Medical and other health Sciences students. It is located 275 km from Addis Ababa to the southern of Ethiopia, in Hawassa town. The Hospital was established in 1996 E.C. It offers service at general and specialty levels including internal medicine ,pediatrics and child health, general surgery, gynecology and obstetrics, ENT, neurology, neurosurgery, urology, psychiatric, ophthalmology , dermatology, dentistry, radiology, pathology , laboratory, anesthesia and pharmacy service.

Yirgalem Hospital is public hospital. It is located in Yirgalem town, of Sidama zone.

### 2.2. Study subject

**2.2. 1. Source population:** Source population was all injured victims admitted to selected hospitals in Southern Region of Ethiopia.

**2.2. 2. Study population:** Costs of all injured clients in selected hospitals of Southern Region, Ethiopia during a study period.

2.3. Study design (study type, sample size and sampling procedure)

### 2.3. Sample Size Determination

The sample size was determined by using Israel (1992) formula, which is the most familiar and simplest as well as precisely represents the proportion of target population. To come up with correct finding, the formula is given by: Since the researchers didn't get any proportion from previous studies, the sample size was calculated using single population proportion formula, assuming  $P= 50\%$ , at confidence level of 95% and marginal error of 5%, a total 423 respondents were included. Which is valid where  $n$  is the sample size,  $Z_2$  is the abscissa of the normal curve that cuts off an area at the tails ( $1 - \alpha$  equals the desired confidence level of 95%) i.e.  $\alpha$  is the desired level of precision,  $p$  is the estimated proportion of an attribute that is present in the population, and  $q$  is  $1-p$ . The value for  $Z$  is found in statistical tables which contain the area under the normal curve.

$$n = \frac{(Z_{\alpha/2})^2(pq)}{d^2} \quad \text{where, } q= 1-p$$
$$= \frac{(1.96)^2*(0.5*0.5)}{(0.05)^2} = 384$$

= Non-respondent rate was taken 10%

= Total sample size = 423

### 2.4 Sampling Procedures

Random sampling technique was done within each health and insurance institutions and police office to estimate costs of sample individuals which was the unit of analysis.

### 2.5. Study methodology

Placing a value on each of the cost component may not be straightforward as it depends on not only the availability of data but also the manner in which the estimates are derived. There are several approaches to estimate the costs (Mohammad, 2015). Hills and Jones-Lee (1983) and Mohammad, (2015) have discussed the following six methods for evaluating the cost of fatal accidents. These are: the "Gross Output or Human Capital " method, "Net Output" method, "Life Insurance" method, "Court Award method, "Implicit Public Sector Valuation" method and the "Willingness to Pay" method.

The Human Capital approach is one of the main methods for estimating the costs of RTCs. In the HC approach the cost of RTCs is estimated as the sum of resource costs (i.e. property damage, medical and police costs and production lost) and other costs normally named as intangible costs (pain, grief and suffering).

In this study, the costs were divided into three domains: direct, indirect and intangible costs. Direct costs included pre-hospital, hospital, post-hospital (physical therapy and rehabilitation), administrative and funeral costs and the cost of property damages. Indirect costs were considered as production lost. Finally

intangible costs were considered as cost of pain, grief and suffering. The costs were estimated according to the severity and the level of injuries resulted from the RTCs. All the costs were calculated in Ethiopian Birr (ETB). At the time of the study, the exchange rate for a US Dollar was about 28.000 ETB.

The severity of injuries was classified into four groups including fatal injury, serious injury, slight injury and property damage only. Most European countries define different accident severity level as follows (TRL, 2001): An accident is said to be fatal accident if one or more victims die within 30 days of occurrence of the accident. On the other hand an accident is termed as a Serious Injury Accident if one or more victims are seriously injured as a consequence of the accident but there are no deaths. A serious injury is defined as either one for which a person is retained in hospital as an "in patient", or if any one of the following injuries are sustained whether or not he or she is held in hospital:- fractures, concussion, internal injuries, crushing, severe cuts and lacerations, or severe general shock requiring medical treatment. A Slight Injury Accident is an accident as a consequence of which there are no deaths or serious injuries but the victim is slightly injured (outpatient). A slight injury is an injury of a minor character such as a cut, sprain or bruise. Damage-only accident is one in which no one is injured but damage to vehicles and or property is sustained.

The medical costs, administrative costs, funeral costs, intangible costs and production lost were put in one category of costs and these costs have calculated by the severity of injuries. Finally the costs of property damage were calculated separately.

This method is based on the assessment of economic consequences, usually supplemented by a notional sum to reflect pain, grief and suffering of the victims and their family members. In contrast, the "Net Output" method deducts the future consumption of individuals killed in the accidents, reflecting a more conservative economic cost to the society. The "Life Insurance" method measures the valuation of risk associated with the road usage and is determined by the premiums which the driver population is willing to pay (Hills and Jones-Lee, 1983).

The "Court Award" method is based on the actual compensation settlements awarded, which may be influenced by the degree of negligence found. In the "Implicit Public Sector Valuation" method, a set of implicit values, are used to value human lives. The "Willingness-to-Pay" method estimates the amount of money people affected would pay to avoid an accident. The various methods of costing are built on very different premises and thus result in vastly different cost figures. The choice of the method depends on the purpose of the costing exercise. In developing a suitable methodology to estimate road accident costs for the purpose of maximizing national output as well as social benefits, Jacobs have evaluated these methods and proposed that only the Gross Output and the Willingness-to-Pay methods are most appropriate. In this study, a human capital approach was used to estimate the costs of road traffic costs in the study area. It is considered the better approach for conventional cost benefit analyses and the most efficient way of allocating scarce financial resources (Jacobs, 2000).

## **2.6. Indirect cost or lost output**

The loss of output may be due to absence from work resulting from medical leave or reduction of potential productive output arising from long-term or permanent disabilities as well as death. The former includes costs associated with medical and rehabilitation treatment, damage to property, administrative, professional and emergency services (Mohammad, 2015). Lost output refers to the contribution that accident victims have forgone due to injury or death. In the case of an injured victim, the economic loss is measured in terms of the loss in productivity throughout the period of incapacity. This is estimated by tracing records on the duration that the victims are hospitalized or given medical leave of absence from work. On the other hand, for each deceased person resulting from the accident, there will be the loss of future production of the individual to the economy. This is clearly dependent on the age of the individual at point of death. As the duration is measured in years, the loss of income in future years will have to be adjusted to the present value (Hills and Jones-Lee, 1983, Mohammad, 2015). A discount rate of will be 5% is assumed in the study. This does not take into account the age-dependent effect of productivity as such information is not available.

Production lost was calculated for fatal, serious and minor injuries by the following formula.

$$\text{Production lost of fatal injuries} = \frac{\sum w (1 + g)^i}{(1 + r)^i}$$

Where: W=average annual GDP per capita, r=discount rate (5%), g=growth rate of the economy, mean economic growth in the past 30 years), i=average number of years lost per crash (life expectancy- death year).

### **Discounted Costs**

In terms of economic costs, the study considers the effects of time over money. These was calculated using the current value of future costs and income and an equation that considers the discount rate and the number of years lost between now and up until when the costs occur (Mark, etal .2005).This is illustrated by the

Present Value formula: The present values of all future amounts is summed up to calculate the cumulative present value (CPV) of the amounts over period (N) assuming no change on the amount. This is demonstrated by:

$$CPVP = \frac{P}{(1 - r)^n}$$

Where in: P = amount  
 n = years in the future  
 r = effective discount rate

**2.7. Ethical Clearance**

Permission to conduct the study was obtained from SNNPR health bureau and Hawassa University. Confidentiality of residents was maintained at all levels of the study by using codes which was only known by the researcher.

**III. RESULT AND DISCUSSION ON COST ESTIMATION OF RTA**

**3.1. Demographic characteristics of the respondents**

The main demographic variables included in this analysis are sex, age, marital status, religion, family language, family size, and education status of respondents.

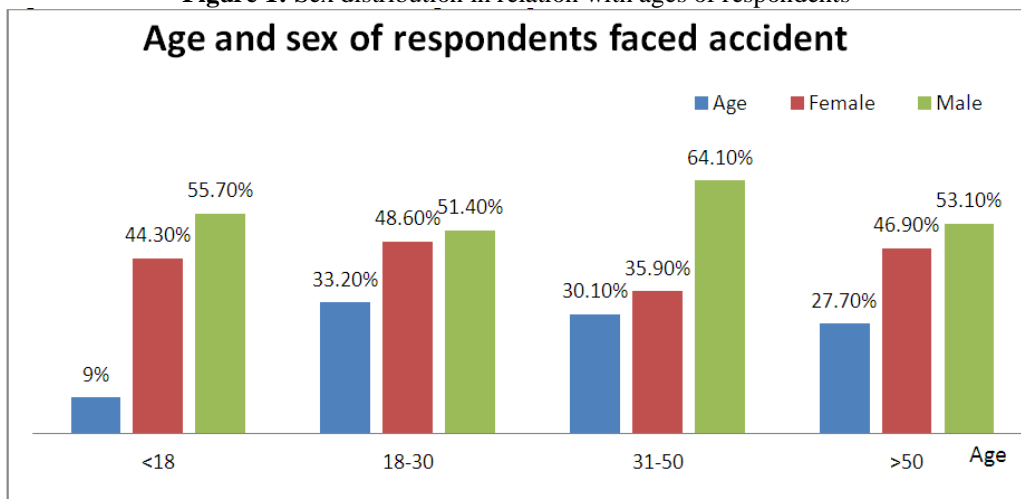
There is difference in perception and reaction to any decisions between male and female. In table1, the results show that 54.84 percent of the respondents are male and the remaining 45.16 percent are females. Similarly, from respondents 46.09 percent were married, 52 percent were single and 1.91 percent was widowed. In table 1 again, most of the respondents were Protestants comprising 37.11 percent with 24.82 percent of Muslim, 21.04 percent of orthodox, 10.63 percent of catholic, 4.96 percent of traditional religion, and 1.41 percent respondents no religion.

**Table 1:** distribution of respondents by demographic characteristics

Variable	Response	Frequency	Percent
Sex	Female	191	45.16
	Male	232	54.84
Marital status	Married	195	46.09
	Single	220	52
	Other	2	1.91
	no religion	6	1.41
Religion of Respondents	Traditional	21	4.96
	orthodox	89	21.04
	catholic	45	10.63
	protestant	157	37.11
	Muslim	105	24.82

Source: own survey, 2019

**Figure 1:** Sex distribution in relation with ages of respondents



Source: own survey, 2019

The analysis of road traffic accident by sex and age group showed a uniform predominance of males over females in all age categories; where males accounted for almost 55.7% of accident in the age of below 18. Whereas males' percentage counted is 51.4 % between 18 up to 30 years of age. Even the proportion of males reached 64.1 % in age range between 31 up to 50 years of age. The working age group between 15 and 50 years accounted for more than two-thirds of below 18 years traffic accident (Figure 1). Additionally, percentage of injured persons between 32 up to 50 years of age is reached 64.10 %. This has a great impact on the family and on the nation at large because the loss of such active working group may lead to foregone GDP due to the diminished workforce and economic shock to families that have lost a breadwinner.

**Table 2: occupation of respondents**

Victims occupation	Frequency	Percent
Student	79	18.7
Government Employee	103	24.3
Farmer	66	15.6
Businessmen	54	12.8
Daily workers	87	20.6
Private drivers	13	3.1
Others	21	5.0

Source: Own survey, 2019

Government employees were more vulnerable for accidents comprising 24.3%, this study showed 20% daily laborers and 28 % students were more involved. But those of private drivers are least affected (3.1%).

**Table 3: Hospitalization**

Days	Frequency	Percentage
1-30	141	33.3
31-180	204	48.2
180-360	62	14.6
Over 1 year	16	3.7
Total	423	100

Source: Own survey (2019)

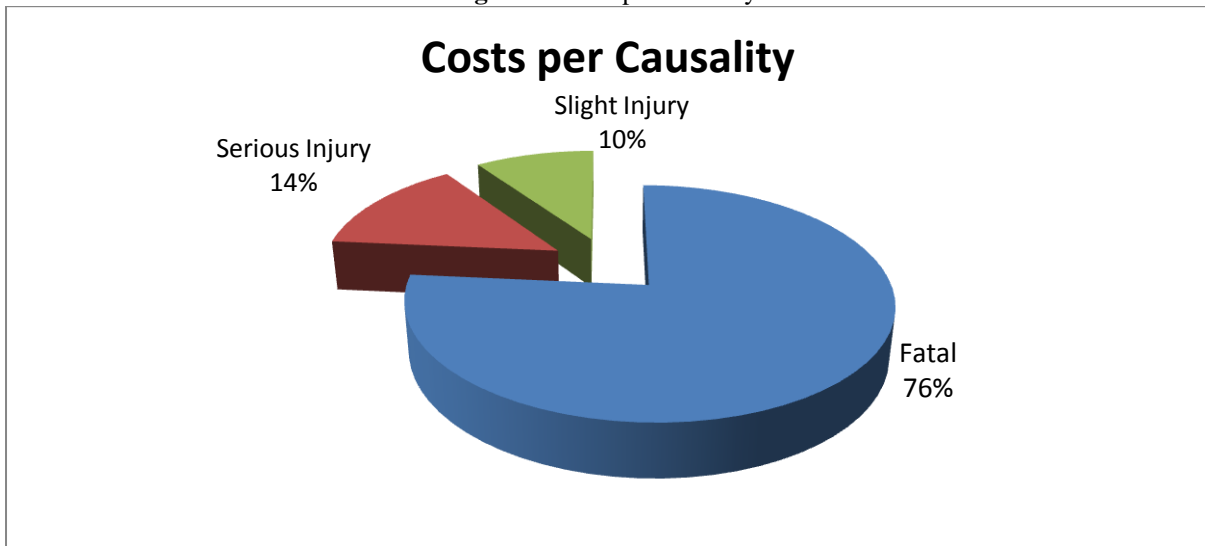
141 victims (33.3%) had a hospital stay of between 1-30 days, while 204 (48.2%) were hospitalized for 31-180 days. 62 RTA victims (14.6%) stayed for a period exceeding 180 days, while 16 victims had stayed over a year in the hospital.

**Table 4: Economic cost of traffic accident**

Cost Component	Fatal	Serious Injury	Slight Injury	Property Damage	Average
		Causality			
Medical Cost	30,034	20,546	14,342.5	-	21,640.83
Lost labor Output	614,939				614,939
Pain, Grief, and Suffering	89,345.56	68,546.8	47,345	-	68,412.45
Cost per Casualty	244,773	44,546.5	30,843.75		
		Per Crash			
Property Damages (Repair, Towing Cost and Lost Economic Output) Cost	-	-	-	540,057	540,057
Administration (Insurance, Legal or court and Police) Cost	135,345.3	44,954	20,341.5	204,245	101,221.5
Cost per Crash	135,345.3	44,954	20,341.5	204,245	

Source: own Calculation, 2019

Figure 2: costs per causality



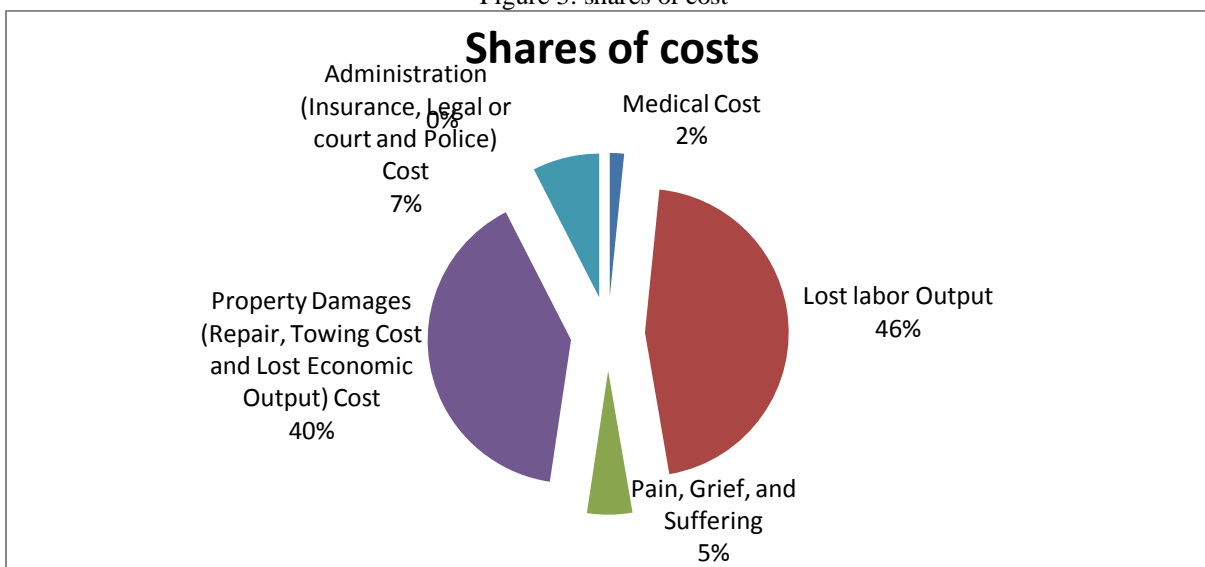
Source: own survey, 2019

Figure 2 showed that fatal takes 76 %, serious injury about 14 % and slight injury about 10%. Additionally, figure 3 below illustrates the components of traffic accident costs in selected hospitals in SNNPRS. Property damages comprise 40% of the total accident costs. This finding is comparable with the results of some previous studies (Morden, 1989), which reported that property damage costs may reach up to 55% of the total traffic accident costs. However, lower share of property damage costs would be obtained if more appropriate willingness-to-pay approach was used. Also, the costs of hospitalization and medical treatments of accident fatalities and injuries account for 2 % of the total accident costs. Again, this percentage is compatible with the results of previous studies

(Miller et al., 1997), which indicated that these costs vary from 2 to 11% of the total traffic accident costs. The cost of human losses, including loss-of-output due to fatalities and injuries consists of 46 % and loss of quality of life or pain and suffering, constitutes about 5 % of the total accident costs. Obviously, this percentage would be much higher if more appropriate willingness-to-pay value was used.

Finally, the costs of police activities and insurance administration are accounted for 7 % of the total costs. Finally, we believe that traffic accident costs estimated in this study are conservative for basic reason that the costs were estimated only for reported traffic accidents. In fact, there is no documented information of the level of unreported accidents in study area.

Figure 3: shares of cost



Source: own survey, 2019

## 1.2. Medical Costs

Medical costs of those injured in crashes range from at-scene to recovery, or death, and include first aid and rescue services (ambulance), hospital costs (food and bed, operations, xrays, medicines, doctors services) and rehabilitation costs (treatment and prosthetics).

It has been tried to collect as much relevant information as possible though it is difficult to obtain all the required data only from hospital. Based on the possible data that could be available the data collection form is redesigned. Basically there are data which are obtained from the victim's medical records like duration in the hospital, x-ray, medication, operation etc; and there are also some data which can only be obtained by making interview with appropriate personnel in the hospital like the daily cost of food and bed, the average number of bed in a trauma ward, the number of victims visited by a doctor per day etc. Medical treatment in Ethiopia is highly subsidized by the government. As per the information obtained from Hospital administrators and medical directors the government provides subsidy for medical treatment in these hospitals.

Medical costs only usually constitute a small proportion of the total costs of crashes. However, the burden of road casualties on medical sector resources is likely to be significant

According to figure 3, the computations have produced an average of 20,546 birr for serious injury, which includes among others ambulance fees, hospitals charges, medicines and professional fees from medical specialists. Serious injuries because of an accident will sometimes result to irreversible acquired disabilities. This will result to added financial burden to the family. It is assumed that the disabled will be taken care of until his death. It was found that the average cost of hospitalization of fatal injuries amounted to 30,034 birr. For minor injury (injury which does not need hospitalization for more than a week), the average cost of treatment is estimated at 14,342.5 birr. This covers first aid and other emergency medical services like ambulance service and emergency room treatment.

## 1.3. Lost Labor Output

Lost output refers to the lost productive capacity from those affected by road crashes and is typically the largest part of casualty related costs. It can range from the value resulting from as little as one day of lost time for a slight casualty, up to decades of foregone work for those killed or permanently disabled. Lost output is believed to have been underestimated in most past studies, as it was limited to the crash victim(s) only and to the number of work days lost - either to recovery or to average retirement age in the case of death. Some of those injured will not return to their jobs, and will spend additional time looking for new employment. Thus there is not only lost working time to take into account, but also reduced income after resuming employment. Lost output estimates should also take account of income lost by caregivers. When someone in a poor family is injured the whole family gets involved; those on daily wages may lose their job, children may not go to school and older members may spend less time caring for infants.

Road accidents could lead to a loss of output in the year in which the accidents occur and in future years. In order to determine lost output certain assumptions have to be made. In the case of fatal accidents obtaining the average age of road accident fatalities and subtracting this from the average age at which the person ceases to work gives the number of "person years lost" and also the lost output due to drivers causing death accident and put into prison is obtained by determining the number of years the driver lost at his stay in jail as a punishment. In the case of serious accidents, estimates must be obtained of the average number of days that the injured person spends in hospital together with the number of days they stayed at home recovering from the accident. In the case of a slightly injured person, an estimate must be obtained of the number of days that the person is off work due to receiving treatment outpatient for their minor injury, or convalescing at home.

Accordingly the average age of road accident fatalities has been calculated for each age group by using the weighted average system. In Ethiopia civil servants retire at the age of 60 years and the corresponding years of lost output following fatal road accidents is shown in the table below for each age group.

Age Group	Average Fatal Age	Years of Lost Output	Number of fatal casualties	Total lost output per victim (Birr)
< 7 Years	3.5	56.5	11	112,815
7 – 13 Years	10	50	15	108,600
14 – 17 Years	15.5	44.5	12	118,563
18 – 30 Years	24	36	140	134,822
31 – 50 Years	40.5	19.5	133	94,909
>51 Years	55	5	112	45,230
Total				614,939

Source: own computation, 2019

Thus, the total lost output cost per victim is estimated to be 614,939 ETB. The lost output cost for slight injuries is estimated from the number of days an outpatient takes rest at home. Accordingly from the interview with doctors and outpatients an outpatient person/slightly injured person could be off work for about 6

days due to receiving treatment for their minor injury. And thus the total cost of lost output is estimated to be 614,939 ETB per injured casualties.

#### **1.4. Pain, Grief and Suffering**

In order to quantify the social cost and emotional burden accidents bring about to the victim and their families, a notional amount to reflect 'pain, grief and suffering' is added to the total costs for each accident severity when using the Human Capital method. The Willingness-To-Pay method is considered the most relevant method for accident and has now been adopted by many developed countries. Pain, Grief, and Suffering was 68,412.45 birr. However, this method is difficult to apply in developing countries, for it is based on complex questionnaires asking about perceived risk and payment for the avoidance of hypothetical risk. The amount to be added in the human capital method could be considered as part of a social objective of poverty alleviation, as accidents are known to have a greater adverse effect upon the poor. The amount to be added is often a political and subjective decision, and an element of judgment is unavoidable.

#### **1.5. Property Damage**

The largest portion of property damage is that which stems from damage to vehicles due to mishaps and lost economic productivity of wrecked public transport vehicles. Other property damage is less significant. Repair garages down to informal 'shade tree or back yard' mechanics were also surveyed. This method is more likely to be representative of the true cost of damage to vehicles, since it includes both insured and uninsured vehicles of different vehicle types.

#### **1.6. Administration Cost**

It is usual in previous international studies that police and administration costs are low compared to other cost components. The reason being is these costs are not direct costs that can be associated to accidents. It is advised not to spend much time and effort in producing detailed estimates of these costs because of the sector's complexity. Police and administration costs are usually low when compared to other cost components.

### **IV. Conclusions and Recommendations**

#### **4.1. Conclusions**

Road accidents pose a serious drain on scarce financial resources and medical services. Road Traffic Accident victims mainly belong to the most productive age range and have often just begun to pay back their debts to society. Based on the findings of the study, the cost based on causality of damage only, slight, serious and fatal road traffic crashes were 540,057; 30,843.75; 44,546.5 and 244,773 Birr respectively in the study area.

Based on this estimated road accident cost, it can be said that road accidents do not cause only losses in lives of productive members of the population and a substantial number of disabilities and injuries but also generate a gigantic loss to the country's economy. It is timely to urge all agencies concerned to put forward more efforts, as well as sufficient manpower and other resources, to effectively address the road traffic accident problems. There is the need for more efforts and resources to be channelled to address the issues of road traffic safety in the country.

Even though intangible costs (lost output and human costs) are big burden of victims and their families, friends and relatives as well as a whole society, those costs are unrecognizable yet to people. The estimation of those intangible costs among the overall costs of road accident is to highlight appropriate recognition and awareness of a whole society to traffic safety aspect. It is necessary that the government should invest more into traffic safety database system to have better statistics and data of road accidents. It would be very useful for the analysis and decision making in improving the road traffic safety in the country.

#### **4.2. Recommendations**

In this regard the concerned body should cooperatively work with insurances to gather summary of statistics on the costs of vehicle repair periodically and with Ministry of Health to have a separate section for road accident casualties in its vital registration books and routine publications.

As it can be seen clearly in this research under-reporting has been considered using very crude and general values proposed by previous studies. However, a separate detail study on underreporting of traffic accidents is very much required and this study strongly recommends conducting research on this topic to arrive at a more dependable and realistic estimate.

So far there are very limited researches conducted in the area of road safety in Ethiopia. Still research efforts are strongly required in this regard. For instance reducing the number of fatal accident will result in huge economic savings. There are also high economic returns in any research effort that can reduce accident severity and frequency.



**REFERENCES:**

- [1]. Fanueal Samson (2006). Analysis of traffic accident in Addis Ababa: Traffic Simulation, Addis Ababa, Ethiopia.
- [2]. Hills P.J. and Jones-Lee M (1983). The cost of *accidents* and evaluation of *accidents* in developing countries. Volume 15, Issue 5, Pages 337-353
- [3]. Israel, G.D., 1992. Determining Sample Size. PEOD6, IFAS Extension, University of Florida.
- [4]. Jacobs, G., Aeron-Thomas, A., Astrop, A. (2000) Estimating Global Road Fatalities. TRL Report Transport Research Laboratory, Crowthorne, Berkshire.
- [5]. Jamil H. Kazmia, Salman Zubair\*,(2013). Estimation of vehicle damage cost involved in *Road Traffic Accidents*. in Karachi, Pakistan: A Geospatial Perspective.
- [6]. Mark R. Primitivo C. Ricardo G. 2005. Estimation of socio-economic cost of road accidents in metro manila. Journal of the Eastern Asia Society for Transportation Studies, Vol. 6, pp. 3183 - 3198,
- [7]. Miller, T.R., Lestina, D., Galbraith, M., 1997. United States passenger-vehicle crashes by crash geometry: direct costs and other losses. *Accident Analysis and Prevention* 29, 343–352.
- [8]. Mohamed, H (2015). "Estimation of Socio-Economic Cost of Road Accidents in Saudi Arabia: Willingness-To-Pay Approach (WTP)," *Advances in Management and Applied Economics*, SCIENPRESS Ltd, vol. 5(3), pages 1-5.
- [9]. Morden, C.H., 1989. An estimate of the cost of road traffic collisions in South Africa for 1988. Strategic Management of Infrastructure, Division of Road and Transport Tech., South Africa.
- [10]. TRL, Ross Silcock Partnership (2001). Study for Sectoral Road Safety Program in Ethiopia. Volume II, Transport Research Laboratory, Addis Ababa.
- [11]. World Health Organisation (2011) *World report on road traffic injury prevention: Summary*. World Health Organization Geneva Switzerland.