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HUMAN CAPITAL AND WILLINGNESS-TO-PAY APPROACH IN ESTIMATING THE COST OF ROAD ACCIDENTS

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The setting

Many developing countries including India have a serious road accident problem. Fatality rate (the rate at which the road accidental deaths per 10,000 vehicles) are quite high in comparison to developed countries. Apart from the humanitarian aspects of the problem, road accidents cost, countries of developing world atleast one of their Gross National Product (GNP) each year – sums that those can ill afford to lose. Compared to causes of death more commonly associated with the developing world, deaths from road accidents are by no means insignificant. The nature of problem in developing countries is in many ways different from that in industrialized world. The proportion of commercial and public service vehicles involved in road accidents are often much greater. Lack of medical facilities in these countries is considered to be an important factor leading to high death rates. Road accidents become a growing problem that threatens the lives of many people around the world. Road accidents cause the death of more than 1.2 million and the injury of between 20 and 50 million people annually worldwide with more than 90 percent of deaths in low and middle income countries (WHO, 2009). Besides human casualties other aspects of losses include material damages such as the vehicles involved in accidents or the publicly owned properties that lie on the road and bad physical of psychological effects on the survival victims as well as the families and friends of the casualties.

The problem of road accident is income singly become a threat to public health and national development in many problems in India. Road accidents comminute to poverty by causing death, injuries, disabilities, grief, cost of productivity and material damages. Accidents incur immense losses to individuals, families and the country by being the cause of so many untimely deaths, debilitating injuries, damage to properties and loss in productivity. In addition to economic losses road accidents have a social component in that victims and/or their families are often beset with grief, hardship and even a degraded quality of life. Although in many cases estimation of the overall cost of an accident is difficult, nonetheless it is necessary to gauge the monetary value of these losses in order to highlight the extent of damage incurred to society as a whole. Hence an attempt has been made to study the accident cost of the respondents.

Concepts

Whenever, an economic approach is attached to a study related with qualitative and psychological effects, the two important concepts should be taken into account to provide the value. Hence, the following concepts have been used to study the economic approach to road accident.

- Human capital (HC) approach estimates the cost of road accidents as the lost earnings endured by casualties.
- Willingness-To-Pay (WTP) approach estimates the cost as the amount individuals are willing-to-pay for reducing the risk of experiencing a road accident.

Methods and Materials

The major focus of this research work is that to find out the cost of road accidents through human capital and willingness-to-pay approach.To carry out this research work, the respondents have been identified with the help of snowball sampling method. The sample size was restricted to 60 members, in the sense that, those who have met with accidents in the previous year were selected as samples for this study. Moreover, to estimate the cost by using human capital approach, it is necessary to have data on cost of injury, damaged vehicle medical treatment costs and lost quality of life to identify the cost of damage of the vehicle it includes the repairing costs, detention period and cost of deteriorating vehicle, cost of police service and cost of insurance administration also taken into account and gathered the necessary information of the sample respondents.

In addition to this, the willingness-to-pay of respondents to reduce risk also gathered from them through raising questions about using helmet, waiting in road signals and their acceptance-to-pay for treatment and repairing the vehicle also incorporated to find out the total cost of road accidents. To analyze the received data with respect to the framed objective of the study, the simple statistical tools like mean and percent were also used.

Road Accidents in Tamil Nadu

The table-1 reports number of road accidents according to type of vehicles during the year 2012. This table reveals that three wheelers and truck/lorry are responsible for highest number of accidents 162280 and 49578. It is believed that road accidents

are increasing since motor vehicle population is increasing with greater rate than the expansion of road network. Presently, vehicle population in Tamil Nadu is over 10 million.

Table – 1,Number of Road Accidents and Type of Vehicles in Tamil Nadu, 2012

Type of vehicles	Fatal		Gracious injury		Minor injury		Non-injury	Total accidents
	N.A	N.P.K	N.A	N.P.I	N.A	N.P.I	N.A	
Bus: Govt.	3027	651	988	5728	9870	1066	10160	24045
Bus: Private	3910	1455	2387	13151	21246	1370	19533	48257
Truck/Lorry	4466	1596	1919	15840	21246	187	21947	49578
Car/Jeep/Taxi/Tempo	390	242	318	2570	4157	71	3260	8125
Two wheelers	2186	376	482	2750	4167	151	5378	12213
Three wheelers	16175	4851	6972	44604	71376	3230	67757	162280
Total	30154	9171	13066	84643	133243	6075	128035	304498

Source: Ministry of Road Transport Corporation, Tamil Nadu
N.A – Number of Accidents, N.P.K – Number of Personal Killed, N.P.I – Number of Personal Injured

The table -1 shows the number of road accidents according to type of roads such as National Highways and State Highways and other District Roads and other Villages roads. The most of the accidents about 162280 and 37344 total accidents of casualties happened due to other district road and national highways respectively.

Table – 2, Number of Road Accidents and Type of Roads in Tamil Nadu, 2012

Type of vehicles	Fatal		Grevious injury		Minor injury		Non-injury	Total accidents
	N.A	N.P.K	N.A	N.P.I	N.A	N.P.I	N.A	
National Highways	3403	1338	1728	11849	16108	1114	16105	37344
State Highways	1575	437	628	5026	8021	152	7130	17354
Other District Roads	16175	4851	6972	44604	71376	3230	67757	162280
Other Village Roads	0	0	0	0	0	0	0	0
Total	21153	6626	9328	61479	95505	4496	90992	216978

Source: Ministry of Road Transport Corporation, Tamil Nadu.
N.A – Number of Accidents, N.P.K – Number of Personal Killed, N.P.I – Number of Personal Injured.

From the year 1993 – 2013, the total number of accidents has decreased from 34925 to 22558 mainly due to reduction in non-fatal accidents. The fatal accident is two models first for Number of Accidents (N.A) and Number of Persons Killed (N.P.K) from the year 1993 to 2013. The total number of accidents has decreased from 6528 to 4893 and 7349 to 5234 number of persons killed.

Accident Severity Index

The accident severity index measures the seriousness of accidents and availability of medical facilities in the city. The accident severity index for Tamil Nadu which shows that number of deaths per 100 accidents is relatively very high in the city. Furthermore, persons killed per 100 accidents have increased over the years, from 25 in 1993 to 45 in 2013, an increase of around 60 percent in the span of just four years.

Table – 3, Accident Details in Tamil Nadu during 1993-2013

Year	Fatal		Grevious injury		Minor injury		Non-injury	Total accident(s)	Total No. of personal involved
	N.A	N.P.K	N.A	N.P.I	N.A	N.P.I	N.A		
1993	6528	7349	3562	5100	17957	27226	6878	34925	39675
1994	7027	7798	4199	3091	18950	28789	6861	37037	42678
1995	7974	8773	4440	6380	21661	31922	7610	41685	47075
1996	8079	9028	4474	7383	22151	31198	7493	42197	47609
1997	7947	8755	4542	6567	23362	34010	8352	44203	49332
1998	8510	9801	6562	8525	23862	33970	7789	46723	52296

1999	8734	9653	5276	7287	27231	34157	6845	48086	51097
2000	8269	9300	5278	8496	29137	44910	6239	48923	62706
2001	8579	9571	5442	8354	30963	45928	6994	51978	63853
2002	9012	9939	5830	8697	32183	46433	6478	53503	65069
2003	8393	9275	5163	8557	31600	46685	5869	51025	64517
2004	8733	9507	4875	7642	33222	49641	5678	52508	66790
2005	8844	9760	5214	7815	34669	54152	5151	53878	71727
2006	10055	11009	4630	6833	36262	57508	4198	55145	75350
2007	11034	12036	4498	6873	39494	64226	4114	59140	83135
2008	11813	12784	4426	6696	39193	63555	4977	60409	83035
2009	12727	13746	4448	6721	39676	63783	3943	60794	84250
2010	14241	15409	4613	6844	42320	68601	3822	64996	90854
2011	14359	15422	4619	6573	42766	67672	4129	65873	89667
2012	15072	16175	4851	6972	44604	71376	3230	67757	94523
2013(upto April 2013)	4893	5253	1564	2075	15068	24081	1033	22558	31390

Source: Ministry of Road Transport Corporation, Tamil Nadu
N.A – Number of Accidents , N.P.K – Number of Personal Killed , N.P.I – Number of Personal Injured

When number of serious accidents is decreasing over the years, increase in accident severity index seems to be result of reduction in quality of available medical facilities in the city. Moreover, high level of accident severity index may also be a result of poor data collection and its reporting process. Traffic police of Tamil Nadu may not be recording all the minor accidents and so, accident severity index shows higher level.

Time of Accidents

The percentage of accidents during day as well as night time, separately and that majority of accidents occurred during day time. On an average, around 70 percent of accidents occurred during daytime in comparison to just 30 percent during night, one should note that this does not imply that daytime driving for a specified length is more risky than night. The estimation of accident risk per unit of pass-km, during day as well as night time, driving during night is more risky than day time. Unavailability of data restricted to estimate the probability of accident risk for a specified length of journey during daytime vis-à-vis night.

Accident distribution by Location

The accident distribution with respect to location of its occurrence and 70 percent accidents occurred on straight roads. T-junction seems to be the least prone to accident. The other three junctions, Y-junction, 4- Way intersection and Traffic roundabout have almost equal share of accidents of 8-10 percent.

Results and Discussion

The aim of this study is on the cost estimation of road accidents by both ways such that, human capital and willingness-to-pay approaches have been used for the estimation of cost of accidents. The following table depicts the basic information of the sample respondents.

Table – 4, Socio – Economic Background of the Respondents

Background Variable (s)	Frequency
Age (31-40 years)	38 (63.0)
Gender (Male)	54 (90.0)
Social group (Most Backward Community)	30 (50.0)
Educational attainment (Illiterates)	32 (53.0)
Occupation (Wage earners)	50 (83.0)
Monthly Income (Rs.5001-10000)	30 (50.0)

Source: Primary data , Note : Figures in parentheses are percent

It is inferred that those who met accidents were in the age group of 31-40 years and mostly they are male members alone. This shows that, the respondents do not have any seriousness about the accident and it has its own impact on their family. The social group shows the nature of the sample area which consist of the specific community (Vanniyars) and belongs to MBC. With respect to the educational background of the respondents more than half of them were illiterates and their occupational category also supports with educational attainment. They are wage earners and working as non-agricultural labourers such as construction workers, load man etc. This shows the poor background of the respondents. There is an association between the nature of job and the earnings of the respondent. The earning capacities of the respondents are limited and it ranges between Rs.5001-10000 per month. Hence, meeting the accident cost is very difficult to them. Moreover, the respondents are doing heavy and painful job in the work spot. Hence, they used to have the habit of taking liquor in order to get relief from body pain and other health related issues. Further they believe that drinking liquor gives happiness and enjoyment in their life. But on the other side, the drinkers lost their life too also.

Human Capital Approach towards Road Accident

As we discussed in the previous pages, there are two important approaches to estimate the cost of road accidents. Let us discuss these approaches in this analysis, by applying the different dimensions of human capital approach on cost of medical treatment, lost quality of life, cost of damaged vehicle which includes repairing cost detention period and deterioration cost after injury and other costs such as cost of damages to some other properties, cost of police service and cost of insurance administration. The indirect cost or cost method was adopted to estimate the lost quality of life. We found some technical difficulties such as, pain grief and suffering etc. while estimating the lost quality of life.

Table – 5,Cost of Road Accidents

Cost Components	Frequency	Mean Value (Rs.)
Cost of treatment (Rs. 250000-500000)	41 (68.33)	212609
Repairing cost to damaged (Upto Rs.10000)	46 (76.67)	6443
Deterioration period to damaged vehicle (Upto 4 days)	38 (63.33)	3 days
Deterioration cost after repairing (Upto Rs.25000)	21(35.00)	16571
Cost of damages to some other properties (Rs. 50000-100000)	26 (43.33)	38177
Cost of police service (Rs.1000-2500)	45 (75.00)	1798
Cost of insurance administration (Rs.2000-5000)	12 (20.00)	424
Lost quality of life (Rs.5000-7500)	49 (81.67)	6154
Total Cost (Rs.300000-500000)	37 (61.67)	375671

Source: Primary data, Note : Figures in parentheses are percent

It could be seen in the table-5, about the cost of road accidents among the sample respondents. For the analysis various cost incurred by the respondents have been taken into account which has the highest frequency. Besides repairing cost to damaged vehicle detention period damaged vehicle also gathered from the respondents. Nearly two third of the respondents replied that the detention period was around 15 days. In addition to repairing cost and deterioration cost after repairing also received during the time of field survey. More than one third of the respondents incurred the cost upto Rs.25000 as a deterioration cost after repairing the vehicle. With respect to cost of damages to some other properties ranges between Rs.50,000 - 1,00,000 (43.33 percent) and average of the same was Rs.38,177. This is shows that accidents not only cause the damages to own property but also others also which give externality of other properties.

With regard to cost of police service that is filling FIR etc., the respondents have incurred minimum of Rs.1000 to maximum of Rs.2500. The average amount spent to police service was Rs.1798. Eventhough, it is a duty of police department, the general public is in a position to pay certain amount to the concern person, those who should protect the society. To avoid risk while driving two wheelers or cars, the vehicle insurance is good for them. But at the time of accident, the man who met with an accident, he/she can claim the insurance amount from the agency. Unfortunately, nowadays the clients has to pay or charges by the insurance company while dispersing the insurance amount to the concern party. This ranges between Rs.5000 to 7500 (20 person) and the mean value of cost of insurance administration was about Rs.1424. Due to lack of appropriate calculation of lost of quality of life, somehow the value has been arrived by using indirect method. This value ranges between Rs.5000 to 7500 (81.67 percent) and mean value for the same component is that Rs.6154. On the whole, the total

cost of accident lies between Rs.3,00,000 to 5,00,000 (61.67 percent) and average cost of accident is that Rs.3,75,671 respectively.

Table – 6, Damage to human parts

Damage to human part	No. of Respondents	Percent
Head	14	23.0
Leg and Hand	32	54.0
Death	14	23.0
Total	**60**	**100.0**

Source: Primary data, *Note : Figures in parentheses are percent*

It is quite obvious that, when accident happens definitely, there will be damages to human parts. It is also concentrated in this study. More than half of the respondents (54 percent) had either lost or damaged their parts of the body like legs, hands and which has been followed by head (23 percent) and met deaths (23 percent) respectively. Hence, the accident makes heavy loss not only to the individual alone but also to the family and member either economically or non-economically. In addition to this, the accidents may lead to dependency to other members in the family.

Conclusions

The problem of deaths and injuries as a result of road accidents in Indian cities is serious enough to demand attention of respective administrative authorities. Apart from the humanitarian aspects of reducing road deaths and injuries, a strong case can be made of reducing road crash deaths on economic rounds alone, it is estimated that the total economic loss due to road accidents is of the order of Rs. 60 billion each year in India. Furthermore, the city traffic police should identify the accident prone locations on the basis of severity and frequency of accidents. In addition to this, the general public should also take care of them while driving the vehicle and should follow the traffic rules in order to avoid accidents. Moreover, the general public should have an idea about the willingness-to-pay on various grounds such as using helmets, waiting in road traffic signals, acceptance-to-pay for treatment and repairing the vehicle. Hence these ideological issues have some positive effect on reducing number of road accidents.

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