

Social Cost of Road Traffic Crashes in India¹

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Issues and concerns

A very large number of high income countries (HICs) have been estimating the costs of road traffic crashes over the past three decades. The methods used and costs allocated have generated a great deal of discussion and debate, in particular because of the difficulty of putting monetary values on pain and suffering. Calculation of direct and indirect costs of injuries, deaths and damage due to road traffic crashes started in the 1970s and many such analyses have been done in USA and Europe. The main objective of assessing costs has been to provide an objective tool for help in selecting more cost-effective countermeasures for road safety and also to justify expenditures for the same. However, critics like Hauer¹ question the very basic principles of cost-benefit analysis where human lives, pain and suffering are involved. Professionals like Hauer working in this area take the position that putting a monetary value on human life is ethically unacceptable.

As far as the liberal economists are concerned the objective of cost-benefit analysis is welfare maximisation. The process is neutral with respect to distributive outcomes and is insensitive to how the impacts are distributed between various groups of the population. For example, in India a large proportion of the pedestrians who get killed would come from the low income strata of the population and car drivers from the high income strata. If a cost-benefit analysis is attempted for increase in speeds of cars in urban areas then the increase in costs due to higher incidence of deaths among poor pedestrians could be offset by time saving of rich drivers. Most people would consider such a justification immoral and unacceptable. However, governments, municipalities, and car and companies do incur costs when human beings are injured or killed in traffic crashes. For these institutions cost-effectiveness analyses does provide a powerful tool for decision making. As long as the cost-benefit or cost-effectiveness analysis does not force us to choose between benefits accruing to different classes of road users or against those who are disproportionately at risk, then we can use such calculations effectively. In particular, cost-benefit analysis is particularly suited to problems that are not adequately solved by the market mechanism. This includes programmes designed to provide better health care, reduce environmental degradation or reduce road traffic crashes. Elvik gives the following guidelines for doing such work;

- Policy objectives need to be clearly stated to support a cost-benefit analysis.

1. Proceedings First Safe Community Conference on Cost of Injury, Viborg, Denmark, October 2002, pp 33-38.

- If road safety is treated as a basic right and an issue involving fairness in distributive justice, then cost-benefit analysis is less suited as a tool. It is much better to use it as purely a technical tool to assess the most cost-effective measure to reduce traffic crashes.
- All economically relevant impacts of policy must be valued in monetary terms. Unless they are, a cost-benefit analysis can give misleading results.

Methods used for assessing costs of accidents

The above discussion shows that costs of injuries, deaths and damages due to road traffic crashes cannot be estimated unless there is a clear perspective regarding the objectives and this must be in consonance with the prevailing society's perspective. These costs would of necessity include all costs associated with injuries--costs to victims, families, government, insurers, and taxpayers and property damage suffered by all. Costs can be prevalence- or incidence-based. Prevalence-based costs measure all injury-related expenses during one year, regardless of when the injury occurred. Incidence-based costs sum the lifetime costs that are expected to result from injuries that occur during a single year. Incidence-based costs are computed by multiplying the number of injury victims times lifetime cost per victim. They measure the savings that prevention can yield. Miller summarises the burden of injury losses into the following categories:²

1. Medical Costs include emergency transport, medical, hospital, rehabilitation, mental health, pharmaceutical, ancillary, and related treatment costs, as well as funeral/coroner expenses for fatalities and administrative costs of processing medical payments to providers.
2. Other Resource Costs include police, fire, legal/court, and victim services (e.g., foster care, child protective services), plus the costs of property damage or loss in injury incidents.
3. Work Loss Costs value productivity losses. They include victims' lost wages and the replacement cost of lost household work, as well as fringe benefits and the administrative costs of processing compensation for lost earnings through litigation, insurance, or public welfare programs like food stamps and Supplemental Security Income. As well as victim work losses from death or permanent disability and from short-term disability, this category includes work losses by family and friends who care for sick children, travel delay for uninjured travelers that results from transportation crashes and the injuries they cause, and employer productivity losses caused by temporary or permanent worker absence (e.g. the cost of hiring and training replacement workers).
4. Quality of life includes the value of pain, suffering, and quality of life loss to victims and their families.

The most difficult and contentious costs to estimate are those for death, disability and quality of life. Miller suggests that pain, suffering, and lost quality of life for fatalities are best valued in dollars using an approach economists call willingness to pay. This approach derives the value of pain and suffering by asking people what they are willing to pay (called contingent value surveys) or by studying what people actually pay for small changes in their chance of being killed or injured.

In the Indian context, it is not very easy to access data which is needed to assess all costs based on above principles. It would be very interesting to calculate the costs based on willingness to pay. Many families in India get destroyed financially in the process of obtaining treatment for road accident victims and the future education and career opportunities of family members suffer in the process. These costs would have to be included in the willingness to pay model. No such efforts at calculating the real costs of accidents in India have been attempted yet. Therefore, most cost calculations for road accidents in India would be gross under estimates.

International Estimates Of Costs Of Road Traffic Crashes

No matter what methods are used, the economic costs of traffic crashes turn out to be so high that it becomes easier for professionals to justify higher expenditures in promoting road safety. A recent report commissioned by the Global Road Safety Partnership of the World Bank summarises the efforts in the area and concludes that overall it does appear that in most countries, costs exceed 1 per cent of GDP which may now be considered to be an underestimate of national accident costs³

Table 1 shows recent estimates of economic costs of road crashes summarised by Jacobs, Aeron-Thomas and Astrop 42. Expressed as a per centage of GDP the costs range from 0.3 per cent in Vietnam to almost 5 % in USA. According to a more recent estimate from OECD the total annual economic loss resulting from road deaths and injuries is estimated to at around \$US 450 billion or about of 2% of GDP in OECD countries.⁴ The policy makers regard this as a cost that society should regard as unacceptable

The values shown in the Table 1 indicate that the estimates for LICs as a per cent of GDP are in general lower than those in HICs. We need to be careful in drawing conclusions from such numbers as that would mean that road safety measures have a higher justification in HICs than in LICs. The more recent estimates for HICs are based on more detailed and comprehensive calculations including the willingness to pay, QALYs and DALYs, etc. On the other hand, to the best of our knowledge, such concepts have not been used in making estimates in LICs. We have mentioned earlier that the official estimates for traffic crash injuries in India could be underestimated by an order of magnitude. If the willingness to pay concept, effect on quality of life, etc. is properly accounted for, it is likely that the road crash costs in India would also be 2 per cent of the GDP or greater. At the intuitive level, this makes sense also for the following reasons:

Table 2.10 Recent Estimates of Economic Costs of Road Crashes.

Country	Study year	Costing method	% GDP	Value US\$mil (1997)	Source
LAC					
Brazil	1997	HC	2.0%	15,681	IADB Review of Traffic Safety
Asia					
Vietnam	1998	HC	0.3%	72	Technical Note: Accident Costing
Bangladesh	1998	HC	0.5%	220	IDC Economics Working Paper Accident Costs
Thailand	1997	HC	2.3%	3,810	SWEROAD Road Safety Master Plan Report
Korea	1996	HC	2.6%	12,561	Elvik, 1999
Nepal	1996	HC	0.5%	24	Road Maintenance Component, TN Accident Costing 1996
Kerala, India	1993	HC	0.8%	--	Chand 'Cost of Road Accidents in India-reference to Kerala'
Indonesia	1995	HC	--	691-958	Accident Costs in Indonesia: A Review June 1997 (Draft Copy), TRL/IRE
Africa					
KwaZulu Natal	199?	HC	4.5%	--	Kwazulu-Natal Road Traffic Safety Strategy (1996-2000)
Tanzania	1996	HC	1.3%	86	1996 Road Safety Programme Tanzania Ministry of Works
Zambia	1990	HC	2.3%	189	TOI Study
Malawi	1995	HC	<5.0%	106	SWK/Iberinsa Road Safety Study, 1997
MENA					
Egypt	1993	HC/CA	0.8%	577	Aly, 'Valuation of traffic accidents in Egypt'
HMC					
UK	1998	WTP	2.1%	28,856	Road Accidents Great Britain: 1998 The Casualty Report
Sweden	1995	WTP	2.7%	6,261	Elvik, 1999
Norway	1995	HC	2.3%	3,656	Elvik, 1999
Iceland	1995	WTP	3-4%	7,175	Arnason, Nordic Road & Transport Research, 1996, v8, n3
USA	1994	WTP	4.6%	358,022	NHTSA Technical Report
Germany	1994	HC	1.3%	30,173	Elvik, 1999
Denmark	1992	HC	1.1%	2,028	Elvik, 1999

- India has a higher rate of road crashes than HICs.
- Since cost of life is reflected in the per capita income of the country and its GDP, the proportion of costs due to loss of life should be similar in HICs and LICs.
- As a proportion of per capita income, costs of similar levels of medical care are higher in LICs as compared to those in HICs.

- Because of a scarcity of good rehabilitation care facilities and lack of aids for the disabled, road crash victims suffering permanent disability would suffer greater lack of access and employment opportunities in LICs
- Owing to lack of welfare functions provided by the state and health care facilities, families of injury victims have to spend much more time looking after injury victims in LICs. This causes greater time and economic losses overall.

If the above issues are taken into account, it is possible that the figure of one per cent of GDP for LICs calculated by Jacobs, Aeron-Thomas and Astrop of the TRL are also underestimates for LICs for costs of road traffic crashes. They have under estimated the the ratio of injuries:deaths at 1:20-30.

It is assumed that death/injury ratios are very high in developing countries. However, a study done in Bangalore shows that while the number of traffic crash deaths recorded by the police is reasonably reliable, the total number of injuries are grossly underestimated⁵. According to this study, deaths were underestimated by 5 percent and the number injured who needed treatment in hospitals by more than a factor of two. The ratio of injured people reporting to hospitals:deaths was 18:1. It is important to note that even this ratio would be an underestimate, because among those injured many would have been treated at home or by private medical practitioners. Another detailed study conducted in Haryana, India, recorded all traffic -related injuries and deaths through bi-weekly home visits to all households in 9 villages for a year.⁶ This study showed that the ratio of critical, serious, and minor injuries was 1:29:69. In 1998 in the United States 41,471 people were reported killed and 3,192,000 injured, yielding a ratio of 77:1 for recorded fatalities:injuries. Other studies yield ratios (deaths:serious injuries:minor injuries) of 1:13:102⁷ and 1:14:80.⁸ Using epidemiological evidence from India and other countries where better records are available, a conservative estimate can be made that the ratios between deaths, injuries requiring hospital treatment, and minor injuries are 1:15:70 in most countries. This would mean that in many LICs the costs of road accidents, if calculated according to the recent international guidelines, would also approach 2 per cent of the national GDP.

Estimates Of Costs Of Road Traffic Crashes In India

There have been a few attempts in India to estimate the costs of road traffic crashes over the past few decades. But, these have followed very simple economic models to include actual expenses and direct and indirect loss of income, etc. One of the early studies which attempted to evaluate road accident costs was conducted for Delhi for the year 1968,⁹ and another study calculated accident costs based on insurance company data for Chennai (Madras) for the year 1978.¹⁰ Both studies used rudimentary methods for cost analysis. The first major road user cost study (RUCS) was published in India in 1982.¹¹ This study, sponsored by the World Bank, included a section on Accidents as a component of road user cost. The costs include were: medical expenses, legal fees, property damage, insurance costs, and loss of out put due to death (future consumption as one-third of income and future output calculated up to the age of 55 years). The latest study on evaluation of

Table 2. Estimates of costs due to road traffic crashes in India

Type of accident	Estimated average costs in Rupees for year of study			
	1968 study for Delhi (Ref. 44)	1978 study for Madras city (Ref. 45)	1978 Road user cost study for India (Ref. 46)	1999 Evaluation of road accident costs for India (Ref. 47)
Fatal	27,805	129,987	49,804	535,489
Serious injury	7,470	35,447	29,510	106,959 B 242736*
Minor injury	870	10,503	321	18,855
Property damage	1,155	10,033	-	-
Damage to buses	-	-	5,467	47,100
Damage to trucks	-	-	6,111	48,700
Damage to cars	-	-	1,200	16,200
Damage to 2-wheelers	-	-	300	4,100
Total cost as per cent of GDP			0.29	0.69

* In this study two categories, serious and major injuries were used.

road accident costs was sponsored by the Ministry of Surface Transport (Roads Wing, Research Scheme R-79) and conducted by M/s Tata Consultancy Services.¹² A summary of the values calculated in these studies is given in Table 2.

The shortcomings of the studies done in 1968 and 1978 are not discussed here because they were not intended to project the magnitude of the problem for the whole country. However, the 1982 RUCS undertook an exercise for evaluating the costs by sampling a limited number of accidents from insurance companies, hospitals, and the Motor Accident Claims Tribunal. The study used the gross output loss method for calculating costs, which gives much lower values than willingness to pay method. There are many shortcomings in using such simple approaches. First we discuss the technical mistakes made in the study:

- The life expectancy of Indians was assumed to be 54 years. This is a serious technical error, as this was the life expectancy at birth at that time. Since a very large proportion (approximately 40 per cent) of deaths were at ages below 4 years the life expectancy at birth in India was lower than that at 10 years. If they had calculated the life expectancy of Indians at 5 years they would have found that it was in the region of 70 rather than 54 years. According to their sample only 7 per cent of the victims were under 10 years. Therefore, it is possible that they underestimated the life span by more than 20 per cent.
- The study did not account for the undercounting inherent in the official statistics on road accidents. As mentioned earlier in this paper, fatalities in India may be underestimated by about 5 per cent, and injuries by an order of magnitude. RUCS uses road accident data which has ratios for fatality:serious-injury:minor injury of 1:1:3.4. As suggested earlier this ratio is more likely to be in the ratio 1:15:70 in India. If these ratios had been assumed the there would have been an

additional burden of approximately Rs. 1,5000 million to their total of 2,360 million!

- The costs of medical treatment are taken from government hospitals, which include a large number of hidden subsidies.
- There is no attempt made to understand the differentials in wages of different road users and to account for it. Since pedestrians and bicyclists are likely to belong to the poorer sections of the population they will lower the accident costs in this way of calculation as they have a higher involvement in crashes. This method therefore does not satisfy the condition of acceptability to the public. Actual costs of permanent disability, pain, etc. were not included.

The above discussion makes it clear that the estimated costs of accidents in the 1982 RUCS study were a gross underestimate by a very large factor and cannot be taken as representative of the actual situation on the ground. The latest study conducted by Tata Consultancy Services gives a higher estimate of road accident costs (0.69 per cent of GDP of India) as it is a much more thorough investigation. However, this study also makes the same mistakes as mentioned above. This study also shies away from using the willingness to pay approach and makes no effort to use the concept of DALYs or QALYs and so its estimates will be low in any case. In addition it suffers from the following factual errors.

- The Useful life of an Indian is assumed to be 62 years. However, according to The World Health Report 2000¹³ the probability of an Indian dying before age 5 was 97 per thousand in 1999 which would give a low life expectancy at birth. This is why even the disability-adjusted life expectancy in India at age 60 was found more than 11 years. Other estimates show that even in 1992-1992 persons at age 10 could expect to live up to 68 years and those at 50 up to 73 years of age.¹⁴ Therefore, this study has also underestimated the life expectancy by more than 10 years (>15%). This is critical, because with improving health standards individuals are active and provide very useful social functions well beyond the age of 62.
- Costs have again been taken from government hospitals, which are not the real costs. The real costs if taken from private hospitals would be much higher. The major statistical error, however, is the underestimate of injuries and vehicle damage in this latest study. For 1995 they use the figures of 68,351 for fatalities and 266,541 for injuries. This is a ratio of 1: 3.9 for fatalities:injuries.
- If a conservative ratio of 1:15:70 for fatalities:serious-injuries:minor injuries is taken and a 5 per cent under count for fatalities we get the figures as shown in Table 3. The cost of injuries alone according to this estimate is approximately Rupees 322,000 million against a total estimate of Rupees 69,502 million by the Tata Consultancy report. This revised estimate indicates the road accident costs to 3.2 per cent of the GDP of India in 1995.

Table 3. Revised estimates for costs of road traffic crash injuries in India for

<i>Injury severity</i>	<i>Estimated number of persons</i>	<i>Estimated cost in 1995 Rs</i>
Fatalities	71,948	38,527,362,572
Serious-major injuries	1,079,220	188,698,379,340*
Minor injuries	5,036,360	94,960,567,800
Total		322,186,309,712
Total cost as per cent of GDP		3.2 per cent

- Vehicle damage costs are probably underestimated also since the authors assume that there were 2,14,397 road accidents in the country as recorded by the police. It is common knowledge that most of the minor injury and damage only accidents are not recorded in India. However, the contribution of vehicle damage costs to the total of road accident costs in India may be lower than that in HICs as a higher proportion of crashes involve VRUs in which vehicles may suffer less damage.

The above discussion shows that the economic costs of road accidents in India is many times the 0.69 per cent of GDP as reported by the TCS to Ministry of Surface Transport. If we take the increases between 1995 and 2000 as 45 per cent for cost of living, and 72,000 to 85,000 for fatalities, then the figure for cost of road traffic injuries and deaths for 2000 can be extrapolated to Rupees 550,000 million. The GDP of India in 2000 is estimated to be Rupees 1,772,183 million, which gives us the cost of road crash injuries as 3 per cent of GDP. This indicates that the real cost of road accidents in India is more than 2 per cent of the GDP, which is similar to the values calculated for OECD countries. This makes sense for the following reasons:

- The total number of road crash fatalities in India is approximately 80 persons per million per year whereas in the USA it is approximately double that amount (161 persons per million). Since loss of income, etc. are based on per capita incomes of a society, then if everything was equal then the health burden of accidents in the USA would be double that of India as a proportion of the GDP. But costs of similar levels of medical care as a proportion of per capita income would be much higher in India than those in the USA, and productivity of injured and disabled persons would be lower in India. Therefore, injury costs as a proportion of the GDP in India as compared to USA may be similar.
- The cheapest car in India costs about 12 times the annual per capita income of an Indian, whereas the cheapest car is about one third of the average income of an American. Or, we can say that a car is about 24 times as expensive in India as far as per capita incomes are concerned. Therefore, loss of a vehicle in a crash or associated repair costs in India would be relatively higher compared to those in HICs. More family time is wasted in India in taking care of accidents and injuries and so these costs would be higher than in HICs.

In light of the above, it is clear that the economic costs of road traffic crashes in India (as a proportion of the GDP) would be at least of the same order of magnitude as in the OECD countries if not higher B greater than 2 per cent.

Problems with using a simple economics approach for poor communities

The experience of poor communities in coping with medical catastrophes is very different than that experienced by economically well off communities. The special problems faced by poor families can include the following:^{4,5}

- Inappropriate or absence of treatment leading to complications and longer treatment time
- Reallocation of labour of family members and reduced productivity of whole family
- Permanent loss of job for the victim even if he/she survives
- Loss of land, personal savings, household goods.
- Poor health and educational attainment of surviving members
- Dissolution or reconstitution of household

None of the above issues are factored in the standard economic calculations done for estimating the cost of road crashes in poor societies. When someone in a poor family is injured and is bed ridden at home or the hospital, the whole family gets involved in the care of the patient. This results in the reallocation of labour of all family members – those on daily wages lose their income; children may not go to school; and older family members may spend less time in the care of children and infants. The household has to cope with the time and financial demands of the situation and this can have a permanent affect on the health of children and infants in the family. This can be the result of loss of income, less attention, worsening hygiene at home, etc.

Since a very large number of poor households depend on daily wages and temporary jobs, don't have health insurance, or the assistance of social welfare schemes, a serious injury can result in permanent reduction of income. In cases of prolonged treatment or death of the victim, the family may end up selling most of their assets and land and getting trapped into long-term indebtedness. Investment in treatment of a seriously ill family member stops only when all assets get sold.¹⁶ A study from Thailand shows that 60% of involuntary land sales were to finance treatment of a family member. Death of a male head of household creates a household headed by a woman. Such families have to suffer serious social and economic hardships and can have negative health effects on children.

It is clear that the outcome of a serious injury or death of a family member in poor communities has many long-term effects, socially, economically and psychologically on all the other family members and the community. Many of these outcomes are permanent and soul destroying for individuals and possibly for the larger community. There is very little work done to understand to understand these issues. Therefore, we must not stop at the calculation of losses in purely monetary terms. For poor communities, our methods do not even capture the economic losses in all their complexity. The effect of injury and death on the family structure, crushing of hopes and aspirations of future generations, and the psychology of the community are just not factored in. We'll have to

take these issues much more seriously in the future and not neglect them just because they cannot be monetised.

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