Socio-economic costing of road traffic accidents: evidence from Nagpur city, Maharashtra, India

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Road traffic accidents (RTAs) have become a serious problem worldwide as they incur losses of around 2% of a country's gross domestic product (GDP). RTAs are one of the major causes of death and injury in developing countries like India. To enable governments to take policy decisions on road safety, it is necessary that good research is undertaken to estimate the cost of accidents. This kind of study will help governments make important decisions on investment in traffic safety, improvement of roads and other facilities. On the other hand, evaluation and estimation of the costs of RTAs will help governments ascertain economic feasibility of policy decisions given limited economic resources. Apart from humanitarian losses, the contribution to economic losses from RTAs is alarmingly high, as most people involved in accidents are from the most economically active and productive age-groups of a society. The main objective of this study is to establish the cost components of road accidents in Nagpur city, Maharashtra, India. The methodologies for such studies generally vary according to traffic pattern, modal share, accident pattern, etc. This study makes use of a system dynamics approach, which provides a comprehensive understanding of the problem for Indian cities. Data were collected and collated with major inputs from the Traffic Department of the city for all road accidents from 2010 to 2015. The study found that the costs recorded for RTAs amounted to INR 935.5 million in 2015, which was 0.09% of the city's GDP. In addition, major cost components were evaluated by varying the severity level.

Keywords: Road traffic accidents, safety measures, socio-economic costing, system dynamics approach.

RAPID population growth and increasing economic activities have resulted in tremendous growth in motor vehicles over the past few years in India. The public transportation system in Nagpur, Maharashtra, India, consists of city buses, but these do not ply along all routes. Thus the existing public transport system is not adequate and people prefer to use private mode of transportation[1]. The growing number of private motor vehicles is one of the primary factors responsible for road accidents in our cities. In India, motor vehicles are growing at a faster rate than economic and population growth. Road traffic injuries are the sixth biggest cause of death in India, resulting in a greater proportion of hospitalization, disabilities and socio-economic losses among the young and middle aged[2]. From a humanitarian perspective, there is an urgent need to reduce road deaths and injuries in developing countries like India. At the same time, a strong case should be made to reduce road-crash deaths on economic grounds alone, as accidents consume massive financial resources that countries cannot afford to lose. According to the estimates by the World Health Organization (WHO), in 2013, road traffic accidents (RTAs) resulted in the death of 1.2 million people globally, with between 20 and 50 million people injured worldwide; more than 90% of deaths occurred in low- and middle-income countries[3]. According to the Association (ASIRT, Rockville, USA) for Safe International Road Travel, RTAs rank as the ninth leading cause of death and account for 2.2% of all deaths globally. The road death rate is projected to rise by approximately 2 per 10,000 people in developing countries by 2020 (ref. 3). According to World Bank, the costs of accidents are almost 2% of the gross domestic product (GDP) of low- and middle-income countries, resulting in massive losses to their economies. In addition, WHO, using studies on disability-adjusted life years, has predicted that road accidents will be the third highest cause of death by 2020. Moreover, in terms of human casualties and material damage, road accidents have the worst impact on the physical and psychological well-being of surviving victims.

Several methods are employed to quantify the costs of accidents, and therefore, it is necessary to adopt a suitable approach for quantification of accident costs, which will help administrators, planners, engineers and politicians realize the enormity of economic loss caused by RTAs. RTA costing is important to draw the attention of society towards this social problem, incurring huge loss in terms of peoples' lives and also resulting in quantifiable loss of money, thereby creating an undesirable additional burden. The main objective of assessing the costs of accidents is to

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provide an objective tool to help in the selection of more cost-effective countermeasures for road safety and to justify expenditure on the same. The findings will facilitate accident safety measures under various circumstances and returns from proper accident reduction countermeasures.

The study of crash costs throws light on the economic losses of a country and the economic benefits arising from the prevention of such accidents. The information gathered from this study can be used for cost–benefit analysis of road safety measures. In addition, social costing estimates need to be developed for the extent to which accidents hamper the social lives of victims and their families, as there might be life-changing injuries like loss of limbs, head injuries and spinal injuries. Moreover, most RTA victims belong to the most economic and productive age-group of a society, which adds to serious economic loss[4,5]. The pain and grief of a victim's family cannot be compensated or measured in physical terms. In addition, psychological effects on child victims as a result of an accident might be particularly severe, as they might suffer from traumatic flashbacks, depression, anxiety, low self-esteem and social anxieties. Thus, apart from the humanitarian aspects of road safety, the injuries and fatalities which occur because of road accidents have serious implications for a country in both economic and social terms[6].

The objectives of this study are as follows.

- To calculate and build accident model and the RTAs cost using system dynamics approach.
- To provide a comparative study of the cost components with variation of severity level.
- To calculate GDP loss of Nagpur city from RTAs and compare it with the national GDP.

The proposed study area is in Nagpur, which is the third largest city in Maharashtra and the 13th largest urban agglomeration in India. Considered the winter capital of Maharashtra, Nagpur had a GDP of USD 15.1 billion (INR 1 trillion) in 2013–14. The growing vehicular population in Nagpur has led to some of the most ghastly fatal road accidents ever in its recorded history. While drunken driving, speeding, traffic violations and rash driving are factors contributing to increasing street accidents, the prime reason behind such incidences is certainly the lack of awareness among citizens. A recent study about accidents in the last 10 years has prompted the traffic police to mark 33 accident-prone spots in the city. Therefore, there is a need to establish the economic loss to the city because of traffic accidents.

Methodology

The Transportation Research Laboratory (UK) has published a report, the Overseas Road Note 10, which outlines a number of systematic methods – at least six – that can be used to calculate the cost of road accidents. The first one is the gross output or human capital approach which quantifies the cost of a traffic accident as the sum of real resources cost, such as damage to the vehicle, medical expenditure and cost of police services and the discounted present value of a victim's future output plus costs that reflect pain, grief and suffering[7–9]. This system has clear disadvantages, as it focuses only on the economic effects of the loss of life and does not account for the value and enjoyment of life forgone[10]. The drawback of this system is that it tends to overestimate the true productivity losses of a country, whereas the loss of a worker leads to only a fictional loss that can be compensated after finding another worker. Second, the net output approach subtracts the amount of the victim's future consumption from the gross output value, as it might be difficult to visualize how an estimate can be derived from what a person 'consumes'. Third, the life-insurance approach treats the cost of an accident or the value of accident prevention as the sum of the real resource cost and the amount for which typical individuals are willing to insure their own lives or limbs. The drawback of this approach is that it does not consider the value of life to the insured person himself/herself, and the estimates are prepared using the amount insured by the person. Thus, there is a chance of fluctuating insurance amounts. Fourth, the court award approach considers amounts awarded by courts to the surviving dependents of those killed or injured as indicative of the costs that society associates with fatalities or the value it would place on their prevention. This involves complex issues, such as the negligence of defendants, whether the person killed or injured was partly to blame, and in the case of the latter, whether he/she has claimed any type of compensation benefits. Fifth, the implicit public-sector valuation approach is based on costs and values, which are determined using values that society places on accident prevention in safety legislation or in public sector decisions taken either in favour or against investment programmes that affect road safety; however, a wide range of variation is observed on the implied values of life within the same sector. Sixth, the value of risk change (or willingness-to-pay) approach assumes that a typical public sector investment in traffic safety provides each individual affected with a very small reduction in the risk of involvement in a fatal accident[11]. The drawback of this approach is that it has been less frequently applied in low and middle-income countries due to unavailability of the required information. The above methods substantially differ in approach and the resultant cost estimates vary largely. The third, fourth and fifth approaches could be used for smaller areas, such as central business districts, localities and communities in which people have the same standard of living or income, as the amount invested cannot be justified for any specific kind of accident. The implicit public sector valuation-based cost

is quite low, whereas the risk change approach gives high estimates of accident costs.

The system dynamics approach works on the same principle as the human capital approach, with modified analysis of the results. Specifically, certain empirical formulas provide adequate assessments of all parameters involved; they are satisfactorily determined and the results obtained can be used for future evaluations. The main concern of a system dynamics study is to understand the various elements operating in a system in order to determine their influence on the stability or growth of the system. The output of the study generally suggests some reorganization or change in policy, which can change an existing problem or guide development.

System dynamics approach

The central concept is to understand the interlink between the objects of the system, dependency and impacts on the stability, growth or decay of the system. The dynamic and nonlinear interactions in social systems, i.e. human, road, vehicle and all other environmental factors can be understood and analysed, and new structures and policies can be designed to improve the system behaviour, which would ensure the evolution of sustainable solutions for road safety.

It is hoped that the output of the study would lead to some reorganization or change in policy that could solve an existing problem or guide developments away from potentially dangerous directions. Language developed especially for system dynamics (in its original implementation, it was known as the industrial dynamics model) is called DYNAMO, an acronym for dynamic models. It is, in particular, a simple language designed for users who have little or no training in programming.

In this study, a model is developed with some empirical formulas for total accidents, fatalities and injury types in Nagpur by applying the system dynamics approach. Here, the costs are divided into three main components: human capital, resources and human suffering[12]. The human capital costs are dependent on the income and consumption of the victim. The cost of resources consists of road damage, vehicular damage, administrative expenses and medical expenses, which in turn are dependent on per capita incomes and taxes levied. The human suffering cost cannot be measured on practical grounds, and therefore, arbitrary values dependent upon the resources costs are presented. The components are selected after closely studying the accident patterns of Nagpur. In addition, an indefinite pattern of relationship can be observed among the sub-components, whose significance is to establish an interrelation between the components and sub-components showing their impacts on the total cost, if the cost components are varied. The advantages of this approach are data accessibility and suitability for Indian conditions. In addition, the grouping of data is beneficial and makes the approach straightforward for the evaluation of results.

Cost analysis

Accident cost consists of the following components:

Public cost composed of human capital cost (HCC) and resource cost (RC).

Private cost or human suffering cost (HSC) can be represented by following equation

- Life period lost × average output per victim (or)
- (Life period lost × average output per victim) – Future consumption (or)
- Value of willingness to insure the life (or)
- Value of court award for accident (or)

$= E_x \times P - E_x \times C,$

where E_x is the expectation of life at age x (years); x being the average age of the accident victims; P the productivity at age x; C is the consumption at age x. The accident cost is calculated as follows:

$$\text{Accident cost} = \text{HCC} + \text{RC} + \text{HSC}.$$

where RC includes damage to roads + damage to vehicle + court overheads + medical expenditure and overheads + police overheads + other incidental expenses and HSC is a national value based on value judgment.

The average gross damage amount paid to the accident victim by the insurance company is as follows:

$$\text{GD} = \text{ND} - \text{SPC},$$

where GD is the average gross damage and ND is the average net damage.

The damage amount paid includes the cost of spare parts and labour charges. The cost of spare parts has a tax component, which has to be excluded in order to arrive at an economic cost.

$$\text{AF} = \frac{\text{SPC} + \text{LC}}{\text{SPC} + \text{T} + \text{LC}},$$

where AF is the adjustment factor for ND, SPC the spare parts cost, T the tax components and LC is the labour cost.

The values of AF for different vehicles have been computed from the data collected from automobile dealers.

The economic cost (EC) of damage to a particular type of vehicle is calculated as follows:

$$\text{EC} = \text{ND} \times \text{AF} + \text{SC} + \text{CL}.$$

Consequential losses

The vehicle remains idle and is not used for commercial purposes. Goods in the vehicle may be spoiled and the

Table 1. Accident data for Nagpur from 2010 to 2015

		Fatal injury		Serious injury		Minor injury		Total	
Year	Accidents	Dead	Injured	Accident	Injured	Accident	Injured	Accident	Injured
2010	301	317	80	375	456	872	868	1754	1404
2011	228	237	45	367	446	637	658	1232	1149
2012	273	280	58	372	452	439	463	1084	973
2013	298	310	75	409	512	558	650	1265	1237
2014	263	281	65	409	496	477	533	1149	1094
2015	254	260	56	497	613	503	534	1254	1203
Total	1617	1685	379	2429	2975	3486	3706	7532	7060

Source: Traffic Department, Nagpur.

Table 2. Number of vehicles involved in accidents

Year	Two-wheelers	Four-wheeler (heavy)	Four-wheeler (light)
2010	464	544	746
2011	362	416	454
2012	299	370	415
2013	370	473	422
2014	337	415	397
2015	396	448	410

Source: Traffic Department, Nagpur.

vehicle may sustain further damage. Insurance companies do not cover these consequential losses. It has been estimated that the consequential loss could amount to 40% of the gross damage amount paid by insurance companies.

Data collection

The accident data were collected on October 2016. Data regarding the number of accidents, fatalities and injuries for Nagpur city were obtained from the Traffic Department, Nagpur for the period 2010–15. To establish the economic cost of vehicles, we visited several garages and service stations to estimate the average cost of damage per vehicle. For medical costs, questionnaires were prepared and distributed to some hospitals in order to approximate the average cost incurred per accident. Similarly, insurance companies were consulted to establish the cost incurred per accident.

Thus, during vehicle crashes on flyovers or bridges, damage might occur to railings, kerbs, side shoulders, and pavement surfaces. In 2015, around INR 7.6 million was proclaimed by the Central Public Works Division (CPWD) for ordinary repair programmes within Nagpur city. A lump-sum amount of 15% of this, i.e. approximately INR 1.14 million, was established for accidental road damage within the city.

For calculation of the components of pain, grief and suffering as well as the administrative costs, the assumptions of the Asian Development Bank Manila were adopted[13]. Tables 1–8 show the collected data and calculations.

Result and discussion

Variations in cost components were observed for different types of injury. The human capital cost for fatal accidents or physical disabilities was 77% of the injury costs, indicating a high proportion of injury costs when the victim's future production and consumption losses are considered. The human suffering cost accounted for 22%, whereas medical and administrative expenses were negligible at around 1% of the costs. This result has been found to be comparable with previous studies which reported fatal accidents or physical disabilities as 73% of injury cost[14]. The scenario is different for major accidents, in which medical costs account for a major proportion, i.e. around 55%, and suffering costs account for 40%. This is because of long-term treatment costs, medicine costs, hospitalization charges, rehabilitation costs and the extremely high financial burden on the victim and his/her family. In addition, accidents sometimes lead to psychological imbalance or anxiety, which cannot be estimated. Higher medical costs for major accidents have also been reported in earlier studies[14]. The losses associated with human capital costs were comparatively lower than fatal accidents, at around 5% for major accidents, as victims could usually return to regular work after recovery. Administrative costs were highest for minor accidents at around 60%, as complex issues might develop, such as whether the other party is to blame, whether the victim is employed, and whether he/she earns an income, depending on the amount to be paid. Medical costs accounted for around 30% and suffering costs for around 10%; the latter is negligible, as costs incurred from minor injuries are substantially less than other accident costs. In this study we have calculated medical cost for fatal, major and minor accidents. An earlier study reported that medical cost varied from 4% to 11% of the total accident cost[15,16].

The property damage cost accounted for 21% of the total accident cost. This is lower than some of the previous findings, where it was reported to be 43% of total accident cost[16]. It has also been reported that property damage cost may go up to 55% of total accident cost[17]. These differences may be due to differences in estimating

Table 3. Gross damage of a four-wheeler in a road accident

Parts damaged	Cost (INR)	Labour cost (INR)	Tax (12.5% of price)	Labour tax (14.5% of labour cost)	Grand total
Frontal damage					
Windshield	5000	1500	625	217.5	7342.5
A/C condenser	5212	500	651.5	72.5	6436
Radiator	3750	400	468.75	58	4676.75
Fan	4777	350	597.125	50.75	5774.875
Intercooler	4412	250	551.5	36.25	5249.75
Body panels	2400	750	300	108.75	3558.75
Bumper	2400	250	300	36.75	2986.75
Headlights	5200	90	650	13.05	5953.05
Bonnet	3800	250	475	36.25	4561.25
Fenders	1600	150	200	21.75	1971.75
Total	38,551	4490	4818.88	651.55	48,511.43
Back damage					
Deck	6500	500	812.5	72.5	7885
Deck glass	1400	250	175	36.75	1861.75
Rear bumper	1980	250	247.5	36.75	2514.25
Rear tail lamps	3550	60	433.75	8.7	4052.45
Total	13,430	1060	1668.75	154.7	16,313.45

Source: Garages and service stations in Nagpur.

Table 4. Gross damage of a two-wheel standard bike (major accident)

Parts damaged	Cost (INR)	Labour cost (INR)	Tax (12.5% of price)	Labour tax (14.5% of labour cost)	Grand total
Wielding	2050	150	256.25	21.75	2478
Front mudguard	510	90	63.75	13.05	676.8
Fork assembly	5150	350	643.75	50.75	6194.5
Headlight assembly	1134	250	141.75	36.25	1562
Wind glass	100	75	12.5	10.8	198.4
Fairing	450	-	56.25	-	506.25
Handle bar	300	100	37.5	14.5	452
Petrol tank	4275	225	534.375	32.625	5067
Grand total	13,969	1240	1746.13	179.8	17,134.9

Source: Garages and service stations in Nagpur.

Table 5. Gross damage of a two-wheeler (minor accident)

Parts damaged	Cost (INR)	Labour cost (INR)	Tax (12.5% of price)	Labour tax (14.5% of labour cost)	Grand total
Front mudguard	510	90	63.75	13.05	676.8
Headlight assembly	1134	250	141.75	36.25	1562
Wind glass	100	75	12.5	10.8	198.4
Handle bar	300	100	37.5	14.5	452
Grand total	2044	515	255.5	74.6	2889

Source: Garages and service stations in Nagpur.

the loss-of-output and economic wealth of the region. It is believed that unreported accidents result in low property damage cost.

Table 9 provides the year-wise comparison of various accident categories. Figures 1 *a–c* to 2 *a–c* show the costs of accidents for various categories with different types of vehicles.

Accident injury cost comparisons

Figure 1 *a* shows that the cost of four-wheeler light vehicle fatal injuries was INR 380 million in 2010, which decreased to INR 240 million in 2011, increased to INR 300 million in 2012, and decreased to INR 240 million in 2015. As the cost of accidents is directly related to their

Table 6. Data from hospitals

Description	Average value		
	Fatal accident/injury	Serious accident/injury	Minor accident/injury
Life expectancy (years)	68.41	68.41	68.41
Average age of accident victim (years)	31.5	31.5	31.5
Period of loss	36.91 yrs	60 days	7 days
Income per month (INR)	8888.03	8888.03	8888.03
Consumption per month	3965.47	3965.47	3965.47
Period of hospitalization (days)	5	30	1
Daily hospital expenses (INR)	3900	3650	5000
First-time payment to hospitals (INR)	1500	7500	1500

Source: Economic Survey of Maharashtra 2014–15. Life expectancy – male: 67.3 years; female: 69.6 years) male: female = 1000:948, Nagpur.

Table 7. Total cost of an injury

Expenses incurred (INR)	Fatal accident/injury		Serious accident/injury		Minor accident/injury	
	Four-wheeler	Two-wheeler	Four-wheeler	Two-wheeler	Four-wheeler	Two-wheeler
Administrative expenses	5108	4438	720	529	25,391	10,974
Medical expenses	21,000	21,000	117,000	117,000	7500	7500
Human capital cost	21,80,052	218,0052	9844	9844	0	0
Human suffering cost	632,608	622,529	90,360	72600	4062	1756
Total cost of an injury	2,838,768	2,828,019	217,924	199,973	36,953	20,230

Table 8. Property damage cost

Damage cost (INR)	Fatal accident/injury		Serious accident/injury		Minor accident/injury	
Economic cost of a damaged vehicle	53,157	17,828	53,157	17,828	17,891	3474
Road damage cost per year	1,140,000					

number, hence in 2010 the cost of accidents was higher compared to the other years. The cost of four-wheeler heavy vehicle fatal injuries was highest in 2013 at INR 320 million and decreased to INR 260 million in 2015. The fatal injury cost for two-wheeler vehicles was almost the same for 2010 and 2015 at INR 230 million, with a small increase in 2013 and a small decrease in 2011. The casualty costs for victims in two-wheeler accidents were comparatively lower than those in four-wheeler vehicles (Figure 1 *b*).

The major accident cost was almost the same for four-wheeler heavy and light vehicles, with higher accident cost observed for four-wheeler light vehicles in 2010 (INR 49 million) compared to heavy vehicles. The accident cost increased from INR 36 million in 2010 to INR 52 million in 2015 for heavy vehicles, whereas it decreased slightly for light vehicles. For two-wheeler vehicles, the accident cost remained constant until 2012 and increased to INR 42 million in 2015. On the other hand, the injury cost of two-wheeler accident victims was comparatively lower than that for other victims.

From Figure 1 *c*, it can be seen that the cost of minor accidents for four-wheeler heavy and light vehicles was almost the same, except that there was higher expenditure for four-wheeler light vehicles in 2010 than heavy vehicles (INR 3.7 million). Compared to 2010, the cost fell in 2012 to INR 5.8 million for heavy vehicles and to INR 6.5 million for light vehicles, but in 2015, it increased to INR 7 million and decreased to INR 6.4 million respectively. Similarly, the curve for two-wheeler vehicles is mostly flat, but the cost incurred is lower compared to other vehicles, with a decrease in cost from INR 4.6 million in 2010 to INR 3.4 million in 2015.

Property damage cost comparisons

The property damage curves were found to be more or less similar to the injury curves. Higher cost values of property damage were observed for four-wheeler light vehicles, i.e. INR 6.8 million in 2010, decreasing to INR 4.4 million in 2011. The highest cost value for heavy vehicular damage was INR 5.9 million in 2013, decreasing to INR 4.8 million in 2015. The two-wheeler vehicular damage costs were substantially lower than the four-wheeler costs, which fluctuated between INR 1.4 million and INR 1.5 million from 2010 to 2015 (Figure 2 *a*).

Property damage costs for major accidents were the same in 2010 and 2015 for light vehicles, i.e.

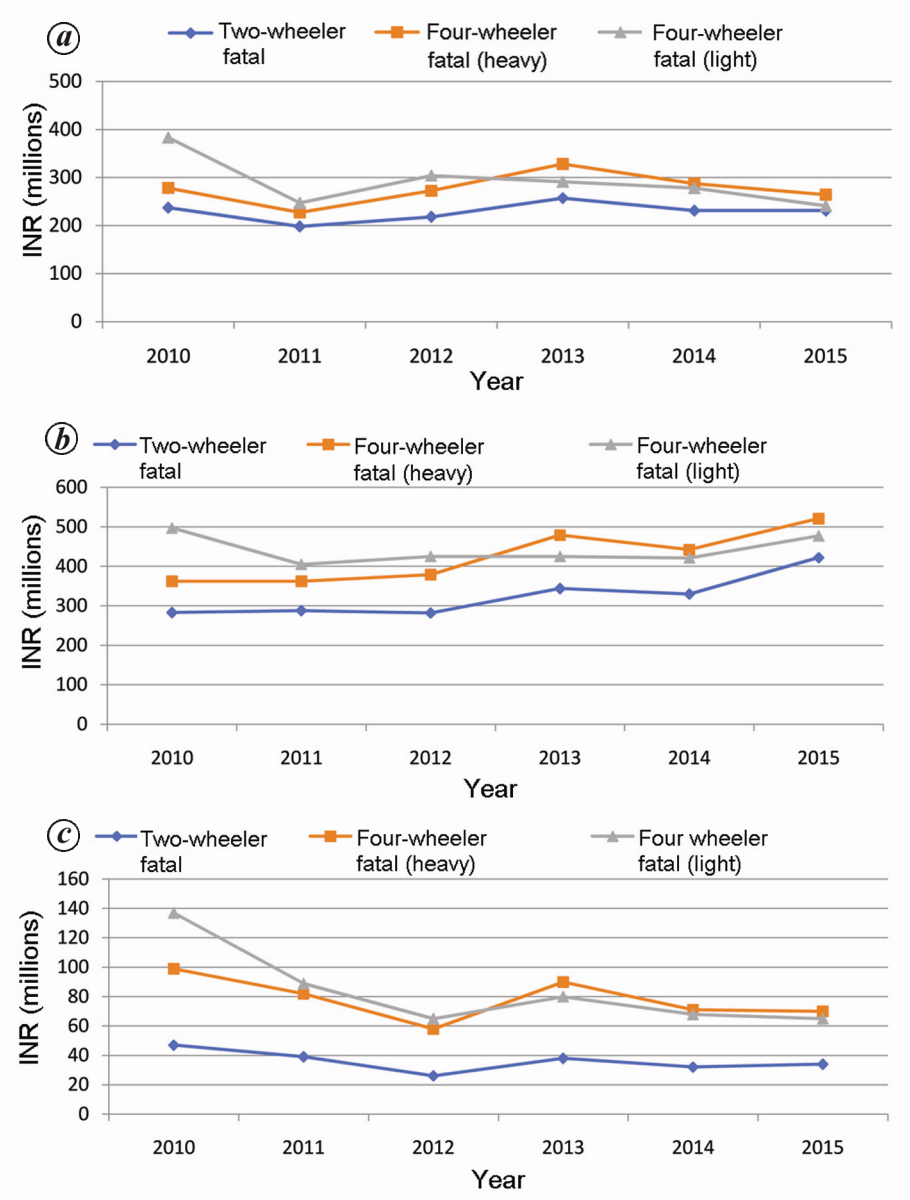

Figure 1. Cost of injuries in fatal (*a*), major (*b*) and minor accidents (*c*).

INR 8.5–8.6 million, although they decreased to INR 7.1 million in 2011. The property damage cost for four-wheeler heavy vehicles increased from INR 6.1 million in 2010 to INR 9.4 million in 2015. The two-wheeler property damage cost has been depicted by an almost flat curve as it is comparatively lesser than other heavy vehicles, although the cost increased from INR 1.7 million in 2010 to INR 2.7 million in 2015 (Figure 2 *b*).

The minor accident cost for both four-wheeler heavy and light vehicles were highest in 2010 at INR 4 million and INR 6.6 million respectively, but dropped sharply in 2012 to INR 2.6 million and INR 3 million respectively, and increasing marginally in 2015 in the case of heavy vehicles. The costs of minor accidents for two-wheeler vehicles were comparatively lower, with damage costs decreasing from INR 7.9 million in 2010 to INR 5.5 million in 2015 (Figure 2 *c*).

Conclusion

The highest cost recorded for RTAs totalled INR 1.084 billion in 2010, decreasing to INR 935.5 million in 2015. The decrease in cost is due to less number of accidents in 2015 compared to 2010. Second, according to the Economic Survey of Maharashtra 2014–15, the present GDP of Nagpur is INR 1 trillion. Given the road accidents costs of INR 935.5 million, this amounted to about 0.09%

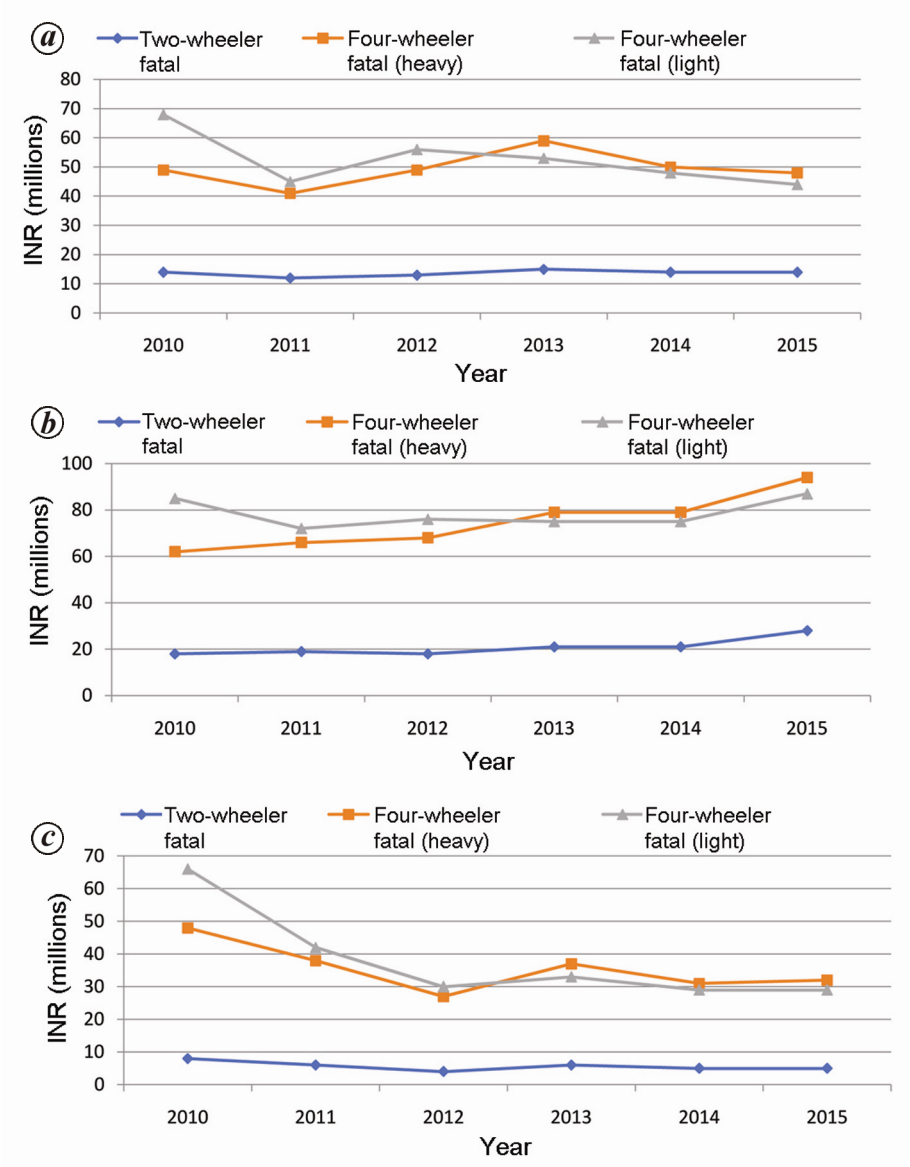

Figure 2. Cost of property damage: ***a***, fatal; ***b***, major; ***c***, minor accidents.

of the city's GDP; it is less than the estimated value incurred for India which is about 3% of GDP. Third, in the case of two-wheeler accidents, Nagpur police have claimed that 80% of fatalities was caused by drivers not wearing helmets, this was also found to be in consistent with earlier studies[18]. Fourth, HCC comprised of 77% of total costs for fatal accidents, i.e. the majority; whereas medical costs were highest for major accidents, i.e. about 55% of total major accident costs and administrative costs were highest for minor accidents which accounted for about 60% of total minor accident costs. Fifth, the trend of major accident costs for injury and property damage increased from INR 130 million in 2010 to INR 163 million in 2015. If future capital cost values are ignored, major accidents would have incurred the highest costs.

The model formulated in this study can be used to calculate the accident rate and its future costs by changing the annual income growth rate or by increasing the discount rate per annum. The results of this study have several implications. First, there is need for an urgent road safety action plan, sector evaluation, enforcement of strong road safety laws, sustained campaigns for road safety awareness, and a quick and efficient post-mishap system. Second, the extent of under-reporting of accidents must be explored as it has been reported in the literature that accidents with less injuries are mostly not recorded in police reports[16]. Third, the complexity of accident administration costing should be acknowledged, which would help justify added resource allocation for the improvement of existing databases and equipment used in accident investigation. Fourth, improved knowledge

Table 9. Year-wise cost comparison of various accident categories

Accident category	Cost (INR million)					
	2010	2011	2012	2013	2014	2015
Fatal accident						
Two-wheeler	278	198	218	257	232	232
Four-wheeler (light)	278	227	272	328	286	264
Four-wheeler (heavy)	383	247	304	291	278	241
Major accident						
Two-wheeler	283	288	282	344	330	422
Four-wheeler (light)	361	361	379	479	442	521
Two-wheeler (heavy)	497	405	424	424	420	477
Minor accident						
Two-wheeler	46	39	26	38	32	34
Four-wheeler (light)	99	82	58	90	70	70
Four-wheeler (heavy)	136	89	65	80	68	65
Property damage (fatal accident)						
Two-wheeler	14	12	13	15	13	14
Four-wheeler (light)	49	40	49	59	50	48
Four-wheeler (heavy)	68	45	59	53	48	44
Property damage (major accident)						
Two-wheeler	18	19	18	21	21	27
Four-wheeler (light)	61	65	78	78	78	94
Four-wheeler (heavy)	85	72	76	75	75	87
Property damage (minor accident)						
Two-wheeler	8	6	4	6	5	5
Four-wheeler (light)	48	38	27	37	30	32
Four-wheeler (heavy)	66	42	30	33	29	29

on administration costing would provide rationale for added road emergency services and mobile traffic patrols. Lastly, the economic loss incurred by RTAs could be utilized effectively for constructive purposes, if safety measures are implemented.

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