

Cost and Burden of Injury in India: An Emerging Public Health Threat

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Abstract

Despite the fact that the number of deaths due to injury are doubling every sixth year in India there is little public awareness about injuries as an emerging public health problem. This paper examines the differentials in the incidence of injury morbidity and associated cost of treatment across population groups. Injury clustering by age and sex is evident from the household health care utilisation survey data and risk factors of getting injury are found to be higher among poor households and those living in urbanized zones. The severity and treatment costs were found to be much higher for injury than other diseases. Injured patients relied more on the public facility, as treatment cost was much higher in the private sector. Even after controlling for socioeconomic status, region of residence and type of health services used, the financial burden on households was higher for treatment of injury than for other diseases. The burden of treatment was higher among the non-insured and varied inversely with the economic status of household, thus suggesting the need for targeted health insurance to protect the poor, students and youth.

I. Introduction

In the process of economic development and modernization, the pattern of injury may shift and/or increase due to changing interactions of hosts with the environment and risks to agents of mechanical, electrical, thermal or chemical energy. There is little public awareness about injuries as a public health problem especially in a developing country like India. For instance, according to the World Development Report 1993, injury is the fourth most important cause of death accounting for nine percent of deaths in the world. In terms of disability adjusted life years lost, injury exerts the most impact in developing countries. In both developed and developing countries, injury has the greatest impact on the males and the prime age group 5 to 44. The gender differences are more pronounced in ages 15 to 44 and in certain types of injuries such as motor vehicle collisions, homicide and violence, drowning and occupational injuries. The situation is not so much different for India, the number of deaths due to injury are growing fast and doubling every sixth year. In terms of disease burden, Injury ranks next only to diarrhoeal diseases and respiratory infections. As the country is experiencing demographic and health transition, it is estimated that by 2020 the injury would be the prime contributor in the total disease burden. This paper attempts to examine the differentials in the incidence of injury morbidity, types of treatment sought and the costs of injury treatment across population groups in rural and urban India.

II. Methods and Materials

The analysis is based on the all-India household survey on the utilization of health services for treatment of illness and injury undertaken by the National Sample Survey Organization. The survey included households reporting a case of hospitalization during the last 365 days and/or a case of illness during last 30 days. The multi-stage sampling procedure was followed to select about 43000 rural and 30000 urban households. The survey was spread throughout the year. Beside various socioeconomic characteristics of the household, for each member of the household who was ill or injured during the reference period, information was collected on the type and duration of ailment, type of health agency contacted and services availed of, and the detailed cost of treatment separately for inpatient and outpatient care. To identify risk factors associated with injury than other disease, the logistic regression analysis was attempted whereas for the determinants of the financial burden on households for injury treatment, OLS regression analysis was used.

In this paper an attempt is made to analyze the household health care utilisation data for the five states of India namely Gujarat, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal. These five states together covered 31 per cent of the geographical area and 45 per cent of the population of the country as a whole in 1991. These states not only belong to different agro-climatic zones of the country but also differ with respect to their level of socio-economic development. Maharashtra, Gujarat and Tamil Nadu are the three most urbanized among the major states. West Bengal is also more urbanized than the country as a whole; whereas Uttar Pradesh had a little less than one-fifth of its population residing in urban areas. In terms of the level of development measured through per capita state domestic product, Maharashtra and Gujarat occupied the third and the fourth ranks (after Punjab and Haryana); Tamil Nadu and West Bengal were 3 and 7 per cent below the national average, whereas Uttar Pradesh was backward, 27 per cent below the national average. Overall, the five states provide a good cross-section of the conditions prevailing in different parts of the country.

The analysis of five states is based on the data collected from 2,872 villages and 1,991 urban blocks. A total of 11,378 rural households and 7,912 urban households have provided information relating to 9,086 episodes of illness involving hospitalization and 18,954 episodes of illness not requiring hospital care. Among them, 1,100 episodes of hospital-based treatment and 615 episodes of non-hospital treatment were reported to be due to injury.

III. Injury Morbidity in India

Distribution and Incidence of Injury and Other Diseases

Table 1 shows the distribution, incidence, and proportion of illnesses requiring hospitalization by disease and injury groups. The fifty pre-coded diseases were regrouped into eleven, using WHO International Classification of Diseases, 1977. Similar to other developing countries, infectious diseases are prominent in India, particularly in rural areas (31 per cent in rural and 24 per cent in urban areas). The next important are the diseases of the respiratory system (15 and 12 per cent in rural and urban areas respectively). The share of injury in total illnesses was rather small, 3 per cent in rural and 4 per cent in urban areas. Annual incidence of injury was also the same, however, it was higher in rural than in urban areas. Also, in the different disease groups the incidence remained higher in rural than in urban areas and overall it was twice higher (1.2 episodes per year for rural and 0.6 episodes for urban).

It appears that the NSSO survey had under-estimated annual incidence of morbidity compared to other micro-level surveys which had been the basis for forming the norm of an average of two episodes per individual per year. There can be many reasons for such an underestimate, the most important are as follows.

- (a) The above estimates did not include untreated illnesses. If we include them the NSSO estimates for rural rises to 1.47 and that of urban to 0.74.
- (b) The estimates exclude the deceased members who were hospitalized or received other treatment and who would no longer be recorded as members of enumerated households (Visaria and Gumber, 1994:20).
- (c) Some under-reporting is likely due to the longer recall period (30 days) which according to international standard is twice the normal length (Gumber and Berman, 1994).
- (d) Quite likely, some of the minor illnesses such as usual cough and cold, aches and pains were either under-recorded or not considered serious enough to be reported by the respondents. The cases of untreated injuries such as cuts, burns, etc. of minor nature were not considered at all.

Moreover, there are inter-state differences in the incidence of morbidity (incidence was low in Gujarat and Maharashtra and high in West Bengal with more variation in rural than in urban areas). In general, we need more survey work on these issues to evaluate the validity of the estimates.

Interestingly, in terms of severity (measured as the proportion of illnesses requiring

hospitalization to all treated illnesses), injury ranked second in rural and third in urban areas, next to diseases of skin and subcutaneous tissue, and neoplasm. It is quite likely that some of the injuries in the form of burns were misclassified as diseases related to skin. Compared to an overall average, injury required 3-4 times higher hospital-based treatment. There are also inter-state variations; the two most urbanized and industrialized states (Maharashtra and Gujarat) have also reported the highest proportion of injuries requiring hospital-based treatment (Table 2).

Table 3 shows the distribution of cases requiring hospital-based treatment and non-hospital treatment by three broad groups of diseases in rural and urban areas. The share of injury is higher in hospital-based treatment (between 6 and 15 per cent) than in non-hospital treatment (between 2 and 4 per cent); whereas it was the opposite in the case of communicable diseases.

The analysis of gender and age differentials in hospital and non-hospital based treatment for injury shows that the males had reported higher incidence of injury than their female counterparts in both rural and urban areas whether seeking hospital or non-hospital based treatment. Such sex differentials were not visible in all illnesses together. Similarly, injury affected the younger population more than the older ones (5-14 in urban areas and 25-34 in rural areas).

Risk Factors Associated With Severe and Non-Severe Injury

An attempt has been made to identify risk factors associated more with injury than other disease through logistic regression analysis. The analysis covered only the treated illnesses because the disease break-up was not available for untreated episodes. The share of untreated illnesses was 16 and 11 per cent in rural and urban areas, respectively. Also, the majority of untreated illnesses were of minor in nature; three-fourths of such illnesses were not considered serious enough for treatment by the respondents.

As observed earlier, certain population groups are at a higher risk of sustaining injury and in certain cases severe enough to require hospitalization. From the available data, 18 risk factors were identified and divided into four categories.

(a) Characteristics of the Patient: It includes six predictors namely sex, age, marital status, education, whether head of household, and whether covered under Employees' State Insurance (ESI) or other health insurance schemes.

(b) Characteristics of the Household: Six predictors identifying the socio-economic status of the household of the host are: whether belongs to a scheduled caste and tribe, major source of income (from self-employment, regular employment, casual employment or other source), monthly household consumer expenditure, whether

belongs to the top 30 per cent of monthly per capita expenditure class (a proxy variable for the better-off), household size, and the highest level of education attained by any adult female in the household.

(c) Characteristics of the Head of Household: Three variables consider the sex, age and education level of the head of the household.

(d) Physical Environment: It takes into account type of state, season, whether the village is located in an urbanized zone, and whether the patient is residing in a town, city or metropolis.

The dependent variable is valued '1' if the person sought treatment for an injury and, '0' if sought treatment for another disease. Four logistic regressions have been attempted (shown in Table 4) to describe differentials in risk factors by rural/urban residence, and hospital/non-hospital based treatment.

From the analysis it is clear that males and the never married are at a higher risk of suffering an injury than another disease. The probability of suffering an injury and not other disease has a strong non-linear relationship (inverted U-shaped) with age, suggesting that the risk is higher among young people than among elders and children. However, the education level of the patient and insurance status were not found to be significant predictors except in the case of non-severe injury in urban areas.

The socio-economic status of the household has shown a varying influence on the probability of having injury rather than another disease. In rural areas, it is higher among persons not belonging to scheduled caste and tribe households and persons living in larger households, and much lower in households reporting major source of income other than from self-employment (rental, pension and dividend income). Similarly, the probability declines with the education level of adult female in the household as well as monthly total household expenditure in rural areas. In urban areas, none of the above socio-economic characteristics of the households is significant; however, if the person belongs to top 30 per cent of monthly per capita expenditure (MPCE) class, the risk of having injury rather than another disease is lower.

Further, only in rural areas the risk of severe injury is higher in female headed households and also in those households where the head is young (aged between 30 and 44) and educated up to secondary or above.

The most important predictor in rural areas turned out to be the risk of living in a highly urbanized region. Every state was divided into certain number of contiguous regions depending upon rural population density and cropping pattern (there were 24 regions in the five states together). The proportion of urban population in that region is used here as a predictor to capture the effect of towns and cities on their hinterland and the degree

of transport and commutation networks in the region. The risk of suffering both a severe and a non-severe injury for rural residents rises with the level of urbanization. The risk of suffering an injury (only non-severe ones) was lower among the residents of cities with population of one million and above than among those of with cities less than 200 thousand population.

Both in rural and urban areas, the season has also shown an important effect on the risk of injury. As observed in other developing countries, the incidence of communicable, particularly infectious, diseases is higher in monsoon than in other seasons. Conversely, the relative risk of injury is much lower in monsoon (July to September) and in the following months of mild winter (October to December) than in summer (April to June).

The risk also varied among the five states. Compared to Gujarat, the rural residents were found to be at the highest risk of having a severe injury in Uttar Pradesh and that of non-severe injury in Tamil Nadu. In urban areas, there was no inter-state differential for severe injury; however, the relative risk was higher for non-severe injury in West Bengal, Tamil Nadu and Maharashtra compared to Gujarat.

Overall, the demographic characteristics of the population and the physical environment are found to be the important risk factors rather than the socio-economic status of the household (particularly so in urban areas). Furthermore, the identified risk factors of suffering an injury rather than another disease, for which some treatment was sought, have shown much more influence in rural than in urban areas and in hospital than in non-hospital based treatment.

IV. Health Care Use Pattern for Injury Treatment

About 62 per cent of patients in rural areas and 63 per cent in urban areas relied on the public sector for the treatment of serious illnesses (involving hospital-based treatment); the percentages varied between a low of 45 in Maharashtra and a high of 93 in West Bengal (Table 5). On the other hand, the care for illnesses not involving hospital-based treatment was mainly sought in the private sector (its share was 82 and 76 per cent in rural and urban areas, respectively and went up to even 90 per cent in rural Uttar Pradesh).

However, the share of public sector providers remained high for injury in both hospital and non-hospital based treatment in all the five states. Overall, the share of public providers for hospital-based injury treatment was 75 and 73 per cent in rural and urban areas, respectively; and for non-hospital treatment the respective percentages were 21 and 32. The share of public providers also varied with economic status of the households (measured in terms of monthly per capita expenditure - MPCE quintile). Figure 11 shows that for hospital-based treatment, the decline in the reliance on the public sector with a

rise in economic status was much faster for other diseases than that for injury. In the case of non-hospital treatment, the share of public providers for injury by MPCE quintile remained stable and that for other diseases showed some decline at least in urban areas.

Thus, irrespective of economic status, the reliance on the public sector for the treatment of injury is much higher than that for other diseases.

Quite likely, those who sustain serious injury have to approach government hospitals, because private providers are hesitant in following bureaucratic procedures involving police and legal enquiry. Also, in the case of motor vehicle collision, the injured is usually shifted by either police personnel or some non-acquainted person to a government hospital where medical services are available round the clock. The government hospital is usually equipped with diversified services including the surgery, orthopedics and blood bank which many private hospitals lack. Finally, there is a general tendency among the private providers to refer more serious patients to the public hospitals.

To confirm the above fact, we have analyzed the information on pre- and post-hospitalization by type of provider. Only 29 and 31 per cent of the hospitalized injury patients in rural and urban areas, respectively, had received treatment before they became inpatients; whereas for the treatment of other diseases, the respective percentages were 64 and 62. No significant difference was found between injury and other diseases in the case of continuation of treatment after discharge from a hospital (the respective percentages for injury and other diseases were 63 and 64 in rural and 60 and 59 in urban areas). Furthermore, the share of public providers in both rural and urban areas for pre- and post-hospitalization treatment was higher for injury than for other diseases. (The difference was 5-22 percentage points for pre-hospitalization and 2-8 percentage points for post-hospitalization treatment) Thus, the data corroborate the argument that the impact of injury is rapid and sudden resulting in hospitalization.

V. Cost and Burden of Injury Treatment

There is also some price consideration in choosing a public rather than a private provider, particularly for the treatment of chronic or serious illnesses. Table 6 shows that the average cost of hospital-based treatment in the private sector was 2.5 times higher than in the public sector in rural areas and 4.5 times higher in urban areas. The difference in the cost of treatment between private and public hospitals was much higher in Tamil Nadu and West Bengal and virtually none in rural Uttar Pradesh.

For non-hospital based care, the cost of treatment was much less (about one-tenth that of the hospital-based treatment). Moreover, the difference in the cost of treatment between public and private providers narrowed. Patients, on an average, paid fifty per cent more for seeking treatment in the private sector. Similar to hospital-based treatment, the cost difference was the highest in Tamil Nadu and surprisingly, in Uttar Pradesh the public providers seem to have charged more than the private providers.

It is interesting to note that the cost of both hospital and non-hospital based treatment was highest in Uttar Pradesh and lowest in Tamil Nadu. Tamil Nadu also reported the lowest cost of treatment in the public sector indicating that the public sector is better managed and more efficient there. Moreover, the urban patients paid about 70 per cent more than their rural counterparts for treatment requiring hospitalization and almost double if they had gone to the private hospitals; the urban-rural differential was much smaller for non-hospital treatment, virtually none in the public sector.

For injury the cost of even non-hospital treatment was doubled in rural and tripled in urban areas when compared to the overall average cost of treatment of an illness. A similar differential continued between the public and private providers as well. No significant difference was found in both rural and urban areas for hospital-based treatment due to higher dependency on subsidized public hospitals. However, the cost difference between public and private providers for treatment of injury and all ailments together varied a great deal among five states. In six out of ten population groups, the public/private ratio in hospital-based treatment was lower for injury compared to the overall ratio; and in non-hospital treatment it was other way round. It implies that injury is a high cost need and the cost differential between public and private providers narrows down with the level of severity.

The cost of treatment also depends upon the type of health services availed of (i.e., whether the patient has to pay for the use of hospital bed, medicine, X-ray/ECG/EEG, other diagnostic test, physiotherapy and surgery). Table 6 highlights that in both hospital and non-hospital based treatment, the injured patients underwent more of X-ray/ECG/EEG and surgical operation than those suffering from other diseases; these services contribute relatively more to the total cost than the use of other services. Moreover, in rural areas, for both hospital and non-hospital treatment, no significant difference was found between the patients treated for injury and other diseases with respect to the extent of free receipt of all the health services. A majority of free services (more than 93 per cent for hospital based treatment) were provided by the public sector.

This leads us to the issues of whether the financial burden on households is more for the treatment of injury than that for other diseases; and whether the burden differs between rural and urban areas and among different socio-economic strata.

Financial Burden on Households for Injury Treatment

Financial burden on the households for the treatment of disease or injury depends upon the health insurance coverage, cost of treatment by provider and monthly total household income or expenditure budget. In India, the health insurance coverage of population is limited to only the central government employees and employees of the organized

industrial sector, which constitute a very small segment of the population. The insurance companies so far have paid very little attention to medical insurance because of both low profitability and high risk as well as lack of demand. Thus so far, the main focus of insurance companies has been on covering the risks of material goods and its movement, currency bills, office and factory premises and transport vehicles against fire and theft. Personal accidents as a result of motor vehicle collisions are also covered; however, no attention has been paid to cover other types of personal accidents such as falls or to cover school-going children. Overall, the health insurance coverage under mediclaim including that for personal accidents accounted for a negligible proportion (less than one per cent) of the total business of insurance companies.

The survey had collected information on whether the sick person was covered under ESI or some other health insurance scheme, so that the patient did not have to pay directly to the provider for the use of facility. About 8 and 17 per cent of patients in rural and urban areas, respectively had been covered under health insurance for hospital based treatment; the corresponding percentages for non-hospital based treatment were only 3 and 6. No difference was found in health insurance coverage for patients who sought treatment either for injury or other disease in rural areas; however, in urban areas there was a difference of 4 percentage points in favour of injury involving hospitalization and 8 percentage points for non-hospital based treatment (Table 7). As most of the organized manufacturing sector is located in urban areas, it is quite likely that unskilled and skilled workers who face a higher risk of sustaining injuries and seek treatment have accounted for the difference.

Because of health insurance coverage, the out-of-pocket expenses for treatment were much smaller for the insured than for the non-insured patients. (For insured patients, the average cost of treatment was less than four per cent of the average cost incurred by non-insured patients). As a result, the relative financial burden on households with insurance coverage was far below that shouldered by non-insured households.

To measure the financial burden on households for treatment, it is necessary to compare the expenditure for treatment with either the household's income or total expenditure. In most developing countries, it is difficult to collect information about income; hence, in the Indian NSS collects information on expenditure of households. As a result, the burden is expressed in terms of the total cost of treatment as a percentage of: (a) the average monthly total household expenditure (MTHE), and (b) the average monthly per capita expenditure (MPCE).

The hospital based treatment tends to be quite expensive. Overall, the financial burden was 83 and 92 per cent of the MTHE, and 702 and 516 per cent of the MPCE in rural and urban areas, respectively. The burden was relatively low for the non-hospital treatment and it did not exceed 10 per cent of MTHE and 63 per cent of MPCE. However, in both hospital and non-hospital treatment, the burden was higher in rural than in urban areas,

mainly because of the smaller difference in the cost of treatment compared to the cost of living between rural and urban areas.

The burden was not equally distributed among different diseases and socio-economic strata. The burden of treatment for injury requiring hospitalization was about 50 per cent higher than that for communicable diseases. In the case of non-hospital based treatment, the burden of injury was 100 to 150 per cent higher than that for communicable or all diseases together. Also, the differentials in the burden of injury and other diseases were even larger for households in the lower MPCE quintiles. It was observed that the households belonging to the same MPCE quintile and seeking treatment in the private sector had spent a higher multiple of their total or per capita expenditure.

To obtain the net effect of burden on households for treatment, multiple regression analysis is used. The dependent variable is the ratio of total cost of treatment to monthly per capita expenditure (in the log form). The independent variables were selected from a pool of variables which influenced the cost of treatment, the most. (For further discussion on the determinants of cost of treatment, see: Visaria and Gumber, 1994.)

The ten most important variables selected were: whether treatment was sought for injury, type of health care provider (three categories: free provision of all the services by the public provider, charging a fee-for-service by the public provider, and charging a fee-for-service by the private provider), duration of treatment and whether it was continued for more than a month, whether the patient had insurance coverage, monthly per capita expenditure decile, whether the patient belonged to non-scheduled caste and tribe household, major source of income (from self employment, regular employment, casual employment and other), proportion of urban population in the region for rural residents and the size of town for urban residents, and the state of resident.

It is clear from Table 8 that the most influential variables explaining the variations in the financial burden on households for treatment requiring hospitalization (depicted in terms of *beta* coefficients) were: if treated by a private provider, if treated by the public provider charging a fee-for-service, duration and if the length of treatment was more than a month, MPCE decile, insurance status and the state. On the other hand, for non-hospital based treatment, the duration and if the length of treatment was more than a month and MPCE decile were found more important than the type of provider (public or private) charging for the payment of services. Insurance status did not contribute much to the burden of non-hospital treatment.

The financial burden on households was much higher if the patient was treated in a private sector institution, had no insurance coverage, had undergone a longer duration of treatment, belonged to a non-scheduled caste and tribe household and was the resident either of a highly urbanized zone or of a city with one million or more population. Furthermore, the burden varied inversely with MPCE decile suggesting that the poor

households were the main victims of the inefficient health care system and did not stand a chance to break the vicious circle of poverty, indebtedness, low productivity, malnutrition and disease.

Inter-state differentials were more pronounced in the hospital rather than in non-hospital based treatment. Relative to Gujarat, except Uttar Pradesh, all the other three states showed a lower financial burden on households. For hospital based treatment, the residents of Uttar Pradesh had faced the highest burden of treatment.

Above all, injury was highly significant variable with a positive coefficient in both hospital and non-hospital based treatment in rural as well as in urban areas. It implies that the burden on households, even after controlling for socio-economic status, state of resident and type of provider, was higher for treatment of injury than for other diseases.

VI. Summary and Conclusion

In the process of economic development and modernization, there is a phenomenal increase in injury events due to a greater interaction of host with environment and agents of mechanical, electrical, thermal or chemical energy. Even then in both developed and developing countries, injury has lacked public awareness and under-recognized as a serious public health problem.

In this paper an attempt is made to describe the spectrum of injury morbidity, disability and mortality. Injury clustering in certain age groups as well as by gender is quite evident. A further exploration of risk factors associated with injury morbidity in India suggests that the risk of suffering an injury rather than another disease is higher among young, and never married males and tends to decline with the socio-economic status of the household. The level of urbanization contributes to the risk, particularly in sustaining serious injuries requiring hospitalization. Further, the incidence of serious injuries requiring hospitalization was the highest in the two most urbanized and industrialized states of the country.

At different stages of analysis, it has been found that the fatality, disability and severity (requiring hospital based treatment) are much higher for injury than for other diseases. Also, the injury is sudden, impact is rapid and requires immediate hospitalization which, in turn, demands improved logistics for emergency medical services including transportation, communication and trauma care services.

In contrast to other diseases, injury patients in the five states of India relied more on public sector institutions. About three-fourths of all injuries involving hospitalization and one-fourth of non-hospital based injuries were treated by the public providers whereas the respective proportions for other diseases were three-fifths and one-fifth. The use of

public providers by economic status of the household remained uniform for injury whereas tended to decline for other diseases. A majority of free health services are provided by the public sector institutions and most of the poor households have benefited from it. Overall, the cost of treatment as an inpatient in the public sector was half or one-third that in the private sector; however, the cost differential was minimum for treatment of injury than that for other diseases. In contrast, for non-hospital based treatment, the out-of-pocket expenditure was higher for treatment of injury than that for other diseases.

Beside cost considerations, the other reasons for choosing a public rather than a private provider for the treatment of serious injuries could be the reluctance of private providers to accept serious injury patients due to the fear of police and legal enquiry. Also, in the case of motor vehicle collisions, the injured is usually shifted by either police personnel or some non-acquainted person to a government hospital where medical services are available round the clock.

The analysis of determinants of the financial burden on households for treatment indicates that the poor households have to spend a higher multiple of total or per capita monthly expenditure for treatment. Even after controlling for socio-economic status, state or region of residence and type of provider, the burden was higher for the treatment of injury than for other diseases. The burden varied inversely with MPCE decile and was higher among non-insured suggesting that the poor households are not benefiting much from the public health care system. In the immediate future, targeted specific health insurance should be started to protect the poor against the heavy draft on their meagre resources.

In India, children of school-going age, particularly in urban areas, face a higher risk of sustaining injury. An effort should be made to introduce the community health insurance approach to cover at least the student population for personal accidents. Some private schools in cities, have come forward and covered the students under a group insurance scheme with a very small annual premium. Of course, the premium has been charged from the parents; even then if made universal, every parent would be willing to afford this in lieu of a heavy out-of-pocket expenses for the treatment in a hospital. The other vulnerable group at higher risk of suffering an injury are youth in the work force, who need immediate coverage at least for personal accidents. The employers in the registered manufacturing sector intentionally do not extend health coverage to temporary workers and thus the latter are the most needy but deprived class.

In most of the developing countries, including India, motor vehicle collision is the most important cause of serious injuries due to poor road safety networks. The number of road accidents and resulting fatal injuries are not only the product of high speed, age of the vehicle, alcoholic and smoking behaviour of the driver, but also the composition of traffic moving at varying speeds (pedestrians, bicycles, two-wheeled motor vehicles, cars and four-wheeled heavy vehicles), width of the road and its condition, as well as adequacy of

traffic lights. The Town and Country Planning Department has to work harder in devising better road and traffic management networks as well as in educating the public in general for road safety measures. Even legislative and effective regulation on the use of helmets and seat belts all over the country would considerably reduce the risk of fatal and serious traffic injuries. Similarly, the emergency medical services (ambulances) and trauma and emergency units in the hospitals should be strengthened to avoid unnecessary delays in treatment for injuries which otherwise result in disability, handicap and fatality.

A number of efforts to reduce and control the risk factors for injuries have already been made in most of the developed countries; the list is exhaustive and beyond the scope of this paper. However, the replication of similar safety measures and injury prevention and control programmes, step by step, in accordance to cost-effectiveness would considerably reduce the economic, social and psychic burden of injuries in developing countries.

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Table 1
Distribution, Incidence and Proportion of Illness Treated in a Hospital By
Disease Groups for Five Indian States

Disease Group	Distribution (%)		Incidence (Per 1000)		Treated in a Hospital (%)	
	Rural	Urban	Rural	Urban	Rural	Urban
1. Infectious	30.9	23.5	370	145	0.9	1.2
2. Neoplasms	0.4	0.2	5	1	2.0	8.2
3. Endocrine, Nutritional, Metabolic, Disease of Blood	2.4	3.7	30	23	1.2	2.1
4. Nervous System & Sense Organs	3.9	6.9	47	40	1.9	1.7
5. Circulatory System	9.7	9.3	119	58	0.6	2.0
6. Respiratory System	14.6	11.9	178	72	0.3	0.5
7. Digestive System	5.6	6.8	69	40	1.6	2.2
8. Genitor-Urinary & Musculoskeletal System	2.5	2.3	31	14	1.4	2.0
9. Skin & Subcutaneous Tissue	1.0	0.7	12	4	4.6	8.0
10. Pregnancy & Childbirth	3.4	3.2	42	19	0.2	0.5
11. Injury	3.1	4.0	38	24	3.7	4.1
12. Other	22.5	27.2	278	169	0.9	1.3
All	100.0	100.0	1218	610	1.0	1.5

Note: Disease Groups are based on WHO International Classification of Diseases, 1977.

Table 2
Inter-State Variation in Incidence and Proportion of Injury Treated in a Hospital

State	Incidence (Per 1000)				Treated in a Hospital (%)			
	Injury		Overall		Injury		Overall	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Gujarat	20	20	648	522	5.9	6.6	3.0	1.7
Maharashtra	19	8	765	264	5.0	10.7	1.4	3.2
Tamil Nadu	53	25	1064	685	5.3	4.0	2.3	1.9
Uttar Pradesh	38	24	1237	609	2.2	1.5	0.5	0.5
West Bengal	53	50	2020	1105	4.7	4.7	1.0	0.6
Five Together	38	24	1218	610	3.7	4.1	1.0	1.5

Table 3
Percentage Distribution of Inpatient and Outpatient Cases by Disease/Injury Group

Disease/ Injury	Guj		Mah		T. Nadu		UP		W. Bengal		All	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Rural Areas												
Communicable	35	50	29	42	30	18	37	46	36	43	34	42
Noncommunic.	35	32	44	32	36	33	30	36	30	27	34	32
Injury	6	3	9	3	12	5	15	3	12	2	11	3
Other	24	15	18	23	22	44	18	15	22	28	21	23
All	100	100	100	100	100	100	100	100	100	100	100	100
Urban Areas												
Communicable	25	34	24	37	22	14	28	39	23	36	24	32
Noncommunic.	41	37	43	28	46	34	42	43	42	35	43	37
Injury	15	4	9	2	8	4	12	4	13	4	11	4
Other	19	26	24	33	24	48	18	14	22	24	22	27
All	100	100	100	100	100	100	100	100	100	100	100	100

Note: 'Other' includes not diagnosed diseases as well as diagnosed diseases not mentioned in the list of 50 diseases.

Table 4
Logistic Regression of Being Treated for Injury than for another
Diseases by Hospital and Non-Hospital Based Treatment

Rural Areas

Predictor	Hospital		Non-Hospital		Exp(B)
	B	Exp(B)	B	Exp(B)	
I. CHARACTERISTICS OF THE PATIENT					
1. MALE	.9140*	2.4943	.9518*	2.5903	
2. AGE	.0275**	1.0278	.0587*	1.0605	
AGESQ	-.0343*	.9663	-.0605*	.9413	
3. N.MARRIED	.1330	1.1423	.6066*	1.8342	
4. HEAD	-.2028	.8164	.0154	1.0156	
5. EDUCATION (BELOW PRIMARY)					
PRIMARY	.0137	1.0138	.1012	1.1065	
MIDDLE	.1879	1.2068	.0338	1.0344	
SECONDARY	-.0930	.9112	.2776	1.3199	
6. INSURED	-.0765	.9264	.0877	1.0917	
II. CHARACTERISTICS OF THE HOUSEHOLD					
7. NON SCST	.2611**	1.2984	.2852**	1.3300	
8. EMP.STATUS (SELF-EMPLOYMENT)					
REGULAR EMP.	.2176	1.2431	.2805	1.3238	
CASUAL EMP.	.1070	1.1130	.1099	1.1162	
OTHERS	-.8378**	.4326	-.1388	.8704	
9. LnMTHE	-.1553*	.8562	.0258	1.0261	
10. TOP30% OF MPCE	.0096	1.0097	-.1837	.8322	
11. HHSIZE	.0390*	1.0398	.0121	1.0122	
12. AF.EDUCATION	-.0823*	.9210	-.0984**	.9063	
III. CHARACTERISTICS OF THE HEAD OF HOUSEHOLD					
13. HD.MALE	-.5207*	.5941	-.3486	.7056	
14. HD.AGE (<30)					
30-44	.2984@	1.3476	.2453	1.2780	
45-59	.0027	1.0027	.0234	1.0237	
60+	.0552	1.0568	-.1017	.9033	
15. HD.EDUCATION (BELOW PRIMARY)					
PRIMARY	-.0086	.9915	.0107	1.0107	
MIDDLE	-.1746	.8398	.0097	1.0097	
SECONDARY	.3771**	1.4580	.2132	1.2376	
IV. PHYSICAL ENVIRONMENT					
16. PER CENT URBAN	.8959**	2.4496	1.4096*	4.0945	
17. SEASON (APR-JUN '87)					
JUL-SEP '86	-.2078@	.8124	-.4842*	.6162	
OCT-DEC '86	-.3844*	.6809	-.4008*	.6698	
JAN-MAR '87	-.2566**	.7737	-.1535	.8577	
18. STATE (GUJARAT)					
MAHARASHTRA	.3040@	1.3553	.0364	1.0371	
TAMIL NADU	.4699*	1.5999	.5072**	1.6606	
UTTAR PR.	1.0251*	2.7874	.3615	1.4354	
W.BENGAL	.6566*	1.9282	.0484	1.0496	
Constant	-2.5744*		-5.6082*		

Urban Areas

Predictor	Hospital		Non-Hospital	
	B	Exp(B)	B	Exp(B)
I. CHARACTERISTICS OF THE PATIENT				
1. MALE	.6893*	1.9923	.5045*	1.6562
2. AGE	.0199@	1.0201	.0394*	1.0402
AGESQ	-.0217	.9785	-.0371**	.9636
3. N.MARRIED	.4257**	1.5306	.4275@	1.5334
4. HEAD	-.0752	.9276	.0843	1.0880
5. EDUCATION (BELOW PRIMARY)				
PRIMARY	-.0984	.9063	.3148@	1.3700
MIDDLE	.1861	1.2046	.3832@	1.4670
SECONDARY	-.0888	.9150	.0411	1.0420
6. INSURED	.0226	1.0229	.4509**	1.5698
II. CHARACTERISTICS OF THE HOUSEHOLD				
7. NON SCST	-.1230	.8842	-.0377	.9630
8. EMP.STATUS (SELF-EMPLOYMENT)				
REGULAR EMP.	-.0221	.9781	-.0105	.9895
CASUAL EMP.	-.0463	.9547	-.0209	.9793
OTHERS	-.3019	.7394	-.1410	.8685
9. LnMTHE	-.0164	.9837	.2135	1.2380
10. TOP30% OF MPCE	-.2329@	.7922	-.3149@	.7299
11. HHSIZE	-.0275	.9728	.0057	1.0058
12. AF.EDUCATION	-.0384	.9624	-.0294	.9710
III. CHARACTERISTICS OF THE HEAD OF HOUSEHOLD				
13. HD.MALE	.1283	1.1368	-.0613	.9406
14. HD.AGE (<30)				
30-44	-.2617	.7698	.0717	1.0743
45-59	-.1632	.8494	.1344	1.1439
60+	-.3295	.7193	.0284	1.0288
15. HD.EDUCATION (BELOW PRIMARY)				
PRIMARY	.0682	1.0705	-.0841	.9193
MIDDLE	-.1073	.8982	-.0592	.9425
SECONDARY	.1452	1.1563	-.0433	.9576
IV. PHYSICAL ENVIRONMENT				
16. SEASON (APR-JUN '87)				
JUL-SEP '86	-.3545*	.7015	-.2743@	.7601
OCT-DEC '86	-.3180**	.7276	-.5671*	.5671
JAN-MAR '87	-.1752	.8393	-.0716	.9309
17. STATE (GUJARAT)				
MAHARASHTRA	-.1479	.8626	.4135@	1.5121
TAMIL NADU	-.2693	.7639	.5513**	1.7355
UTTAR PR.	.1684	1.1835	.3675	1.4442
W.BENGAL	-.0230	.9772	.5947**	1.8124
18. TOWN SIZE (<200 THOUSAND)				
200-999	-.1747	.8397	.2704	1.3105
1000+	.0195	1.0197	-.0600@	.9418
Constant	-1.9827*		-6.0200*	

Note: Figures in parentheses show the base category of the predictor.
 Depended variable: '1' for Injury, '0' for Other Disease.
 Significance level: * p<.01, ** p<.05, @ p<.10.
 B: Coefficient, Exp(B): Odds ratio

Table 5: Share of Public Provider for Treatment by Disease/Injury Group

Disease/ Injury	Guj RUR URB	Mah RUR URB	T. Nadu RUR URB	UP RUR URB	W.Bengal RUR URB	All RUR URB
			Inpatient			
Communicable	51.2 55.9	43.8 48.2	49.0 61.9	30.8 57.5	96.2 79.8	58.3 63.8
Noncommunic.	52.9 61.0	45.3 45.8	50.0 54.7	57.6 65.5	92.7 74.8	61.4 61.0
Injury	60.0 73.8	54.8 53.1	65.8 72.4	74.0 78.4	95.0 81.3	75.0 73.4
Overall	50.4 63.2	45.2 48.7	53.3 57.8	48.4 63.1	92.9 76.5	61.7 63.2
			Outpatient			
Communicable	36.1 18.6	30.5 27.5	39.5 46.8	9.4 12.4	18.7 24.2	16.8 21.7
Noncommunic.	31.4 20.5	26.6 29.3	45.3 33.8	8.9 20.4	24.1 29.1	18.8 26.1
Injury	45.5 26.1	22.2 31.3	29.2 34.7	14.7 31.1	21.5 33.8	20.6 32.3
Overall	35.1 18.4	26.8 24.3	39.3 35.7	10.3 17.3	19.5 24.9	18.5 24.2

Table 6: Cost of Treatment (In Rs.) by Type of Provider

Disease/Type of Provider	Guj RUR URB	Mah RUR URB	T. Nadu RUR URB	UP RUR URB	W.Bengal RUR URB	All RUR URB
Inpatient						
Communicable	538 548	683 860	430 342	567 1805	147 318	423 637
Public	321 294	329 203	74 84	806 924	113 127	238 233
Private	766 871	960 1473	772 763	461 2996	994 1074	683 1350
Noncommunic.	871 918	849 1717	499 476	1309 1311	615 1489	796 1259
Public	510 607	298 661	110 168	1290 1219	520 699	547 596
Private	1277 1405	1303 2609	888 1283	1335 1485	1820 3830	1193 2294
Injury	1740 2347	856 1340	370 675	1558 1722	324 443	625 1019
Public	681 1037	636 723	120 74	1110 1868	306 402	314 660
Private	3327 6034	1124 2037	851 1428	2832 1193	669 621	1098 2009
Overall	795 1031	831 1417	438 655	1019 1667	344 986	640 1053
Public	474 640	385 483	105 122	1005 1280	277 453	399 479
Private	1123 1701	1200 2302	816 1386	1031 2330	1233 2722	1027 2039
Outpatient						
Communicable	64 55	53 72	47 41	80 106	40 56	64 75
Public	57 35	35 55	10 11	140 210	23 41	61 72
Private	68 59	61 79	71 68	74 91	44 60	64 75
Noncommunic.	78 107	90 145	48 62	90 101	73 92	81 94
Public	43 112	81 91	14 17	122 90	56 74	65 68
Private	94 105	93 167	76 84	87 103	78 99	85 103
Injury	115 94	96 152	42 85	189 252	116 349	137 231
Public	54 65	97 57	10 46	230 382	212 24	145 141
Private	167 105	96 195	55 105	182 194	90 515	135 273
Overall	82 88	77 109	40 45	88 121	52 85	71 90
Public	59 69	50 66	12 15	123 152	40 52	56 65
Private	94 93	86 124	59 62	83 115	55 96	74 98

TABLE 7
PERCENTAGE OF PATIENTS REPORTING USE OF HEALTH SERVICES BY TYPE FOR TREATMENT
OF INJURY AND OTHER DISEASES

Type of Health Services	Rural Areas			Urban Areas		
	Injury	Other	All	Injury	Other	All
Inpatient						
1. Percentage Reporting Receipt/Use/Underwent						
Medicine	93.4	93.5	93.5	93.3	95.3	95.1
X-ray/ECG/EEG	51.3	30.0	32.4	68.6	46.3	48.7
Diagnostic Test	29.0	41.3	39.9	39.9	53.6	52.1
Physiotherapy	6.8	6.3	6.4	15.1	9.5	10.1
Surgery	26.5	19.9	20.7	30.9	26.9	27.4
2. Percentage Reporting Receipt of All the Services Free including Hospital Bed	38.0 (95.8)	38.9 (96.4)	38.7 (96.3)	49.0 (92.5)	39.1 (92.5)	40.2 (92.5)
3. Percentage Covered Under Insurance	7.7	7.7	7.7	21.2	16.8	17.3
Outpatient						
1. Percentage Reporting Receipt/Use/Underwent						
Medicine	94.2	93.3	93.3	88.0	93.3	93.1
X-ray/ECG/EEG	7.6	2.2	2.4	17.5	5.1	5.6
Diagnostic Test	2.8	3.7	3.7	3.1	8.7	8.4
Physiotherapy	0.9	0.5	0.5	1.8	1.2	1.2
Surgery	3.4	0.7	0.8	6.7	1.0	1.2
2. Percentage Reporting Receipt of All the Services Free	19.1 (63.9)	19.9 (64.7)	19.9 (64.7)	31.8 (65.9)	23.5 (78.6)	23.9 (66.6)
3. Percentage Covered Under Insurance	3.2	2.9	2.9	6.6	6.3	6.3

Note: Figures in parentheses show the share of public institutions in providing free services.

TABLE 8
DETERMINANTS OF FINANCIAL BURDEN ON HOUSEHOLDS FOR HOSPITAL AND
NON-HOSPITAL BASED TREATMENT

Variable	Hospital Based			Non-Hospital Based		
	B	Beta	Sig T	B	Beta	Sig T
Rural Areas						
1. INJURY	.158328	.034818	.0043	.245137	.035891	.0001
2. PROVIDER (PUBLIC FREE)						
PUB. ON PAYMENT	.730436	.221786	.0000	.557980	.122330	.0000
PVT.	1.496292	.481629	.0000	.362927	.106868	.0000
3. DURATION	.012364	.194135	.0000	.077724	.626333	.0000
4. PROLONG	.677747	.154960	.0000	-.781453	-.252065	.0000
5. INSURED	-.399292	-.068244	.0000	-.075140	-.009842	.3045
6. MPCE DECILE	-.086622	-.162938	.0000	-.091473	-.205815	.0000
7. NONSCST	.110027	.029931	.0199	.019132	.006296	.5262
8. EMPLOYMENT STATUS (SELF-EMPLOYMENT)						
REGULAR	-.154813	-.032030	.0109	-.039833	-.009129	.3512
CASUAL	-.223144	-.061660	.0000	-.110750	-.037322	.0003
OTHER	-.539596	-.056412	.0000	-.238937	-.032144	.0007
9. PER CENT URBAN	.399182	.030880	.0267	.091420	.008490	.4464
10. STATE (GUJARAT)						
MAHARASHTRA	-.176795	-.047897	.0064	-.055925	-.016693	.2746
TAMIL NADU	-.425859	-.102499	.0000	-.298622	-.073371	.0000
UTTAR PR.	.262270	.078620	.0001	-.112573	-.043894	.0205
W. BENGAL	-.580027	-.150291	.0000	-.364825	-.110151	.0000
(Constant)	.547646		.0000	-1.500462		.0000
R Square	.361			.340		
Urban Areas						
1. INJURY	.121340	.024100	.0877	.219376	.031930	.0042
2. PROVIDER (PUBLIC FREE)						
PUB. ON PAYMENT	.916561	.268599	.0000	.541688	.118706	.0000
PVT.	1.805199	.570998	.0000	.551509	.161701	.0000
3. DURATION	.008829	.146920	.0000	.092067	.704681	.0000
4. PROLONG	.753414	.157435	.0000	-1.162770	-.344137	.0000
5. INSURED	-.585612	-.116175	.0000	-.195113	-.027930	.0164
6. MPCE DECILE	-.080116	-.144205	.0000	-.117708	-.253679	.0000
7. NONSCST	.194107	.039447	.0065	.058398	.014162	.2138
8. EMPLOYMENT STATUS (SELF-EMPLOYMENT)						
REGULAR	.023968	.007581	.6273	-.005346	-.001992	.8746
CASUAL	-.234074	-.043843	.0039	-.120018	-.028326	.0195
OTHER	-.094680	-.013612	.3514	-.071116	-.012472	.2859
9. TOWN SIZE (<200 THOUSAND)						
200-999	-.066013	-.017316	.2471	.058363	.017829	.1314
1000+	.277608	.077239	.0000	.131601	.042585	.0008
10. STATE (GUJARAT)						
MAHARASHTRA	-.444040	-.128853	.0000	-.035673	-.011601	.5099
TAMIL NADU	-.389985	-.098193	.0000	-.065780	-.019039	.2452
UTTAR PR.	.270329	.069806	.0005	-.005337	-.001816	.9197
W. BENGAL	-.579686	-.137644	.0000	-.336258	-.094299	.0000
(Constant)	.075283		.4748	-2.032985		.0000
R Square	.240			.264		

Note: Dependent variable is the ratio of expenditure on treatment to monthly per capita expenditure (in a log form). Except duration of treatment and MPCE quintile, all other variables are in a dummy form. The base category is shown in the parenthesis. PROLONG means whether treatment continued for more than a month.

B: regression coefficient, and Beta: standardized regression coefficient.