IND

ROAD ACCIDENTS IN INDIA

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1. INTRODUCTION

The number of vehicles registered in India is shown in Table 1. These data show that the total number of vehicles increased from 37 million in 1997 to 73 million in 2004. This represents an annual average growth rate of about 11% for cars and motorised two-wheelers and 7% for trucks and buses. However, these numbers are probably overestimates as personal vehicle owners register their vehicles and pay the road tax once when they buy the vehicle and are not required to pay an annual tax. Because of this, a large number of vehicles remain on the official record even when they are not in use any more. Recent estimates suggest that the actual number of vehicles in use may be about 60-70% of the official number[1, 2]. Table 2 shows the sales of motor vehicles in India in 1997 and 2007. The sales figures also show an average annual increase of 10-12% per year.

Table 3 shows the number of road traffic fatalities and the population of India from 1997 to 2007[3]. The total number of fatalities increased at an average rate of about 4% per year in the period 1997-2003 and the rate has increased to 8% per year since then. The number of fatalities per million population remained around 79-83 in the period 1997-2003 and has since increased to 101. Traffic fatalities per unit population has been taken as an indica-

Table 1 Motor vehicle registration in India

Year	MTW*	Cars/Jeeps	Trucks	Buses	Others**	Total
1997	25,729 (69)***	4,672 (13)	2,343 (6)	484 (1.1)	4,104 (11)	37,332 (100)
2004	51,922 (71)	9,451 (13)	3,749 (5)	768 (1.3)	6,828 (09)	72,718 (100)
Growth/year (%)	10.6	10.6	6.9	6.8	7.5	10.0

* Motorised two-wheelers
** Others include tractors, trailers, three wheelers and other miscellaneous vehicles which are not separately classified.
*** Numbers in parentheses represent row percentages.
Source: Ministry of Road Transport and Highways, Delhi

Table 2 Vehicle sales in India

Year	Motorised two-wheelers	Three-wheelers	Cars	Commercial vehicles	Total
1997	2,885,004 (79)	216,729 (06)	396,450 (11)	169,937 (5)	3,668,120 (100)
2007	7,416,191 (78)	380,663 (04)	1,273,893 (13)	479,593 (5)	9,550,340 (100)
Growth/year (%)	10	6	12	11	10

Source: Society of Indian Automobile Manufacturers, Delhi

Table 3 Road traffic fatalities in India

Year	Fatalities	Population (million)	Fatalities/million persons
1997	77,000	955	81
1998	79,900	971	82
1999	82,000	987	83
2000	78,900	1,002	79
2001	80,900	1,027	79
2002	84,059	1,051	80
2003	84,430	1,068	79
2004	91,376	1,086	84
2005	98,254	1,103	89
2006	105,725	1,120	94
2007	114,590	1,136	101

Source: National Crime Records Bureau, Delhi

tor of the health burden of road traffic crashes on society at the city, regional, or national level. At the individual level, what is of consequence is the risk of injury per trip, and the total number of trips is proportionate to the population. Therefore, traffic fatalities per unit population can be taken as a rough indicator of risk faced by individuals. The risk of being involved in a fatal road traffic crash has obviously been increasing for Indian citizens over the past few years. While some of this increase can be attributed to increase in the number of motor vehicles per capita in India, however, increasing vehicle ownership need not result in increased fatality rates if adequate safety measures are implemented[4].

2. CRASH PATTERNS

Details of traffic crashes are not available at the national level. While the official road traffic fatality data may be close to the actual number, the injury data are gross underestimates[5]. In this report only fatality data are used for analysis as non-fatal data may suffer from many biases.

2.1 Road user category

Official road traffic crash data do not include fatalities by road user category in India. Such data are only available from a few cities and research studies done on selected locations on rural highways. Table 4 shows traffic fatalities by category of road users in Delhi (capital city of India) and selected locations on national highways[4,6]. These data show that car occupants were a small proportion of the total fatalities, 3% in Delhi and 15% on rural highways. Vulnerable road users (pedestrians, bicyclists, and motorized two-wheeler riders) accounted for 84% of deaths in Delhi and 67% on highways. This pattern is very different from that obtained in all high-income countries. The low proportion of car occupants can be explained by the low level of car ownership at 7 per 100 persons as compared to more than 50 per 100 persons in most high income countries. At present levels of growth in vehicle ownership in India, vulnerable road users are likely to remain the dominant mode for the next few decades. The incidence of road traffic fatalities can only be controlled in the coming years if road safety policies put a special focus on the safety of vulnerable road users.

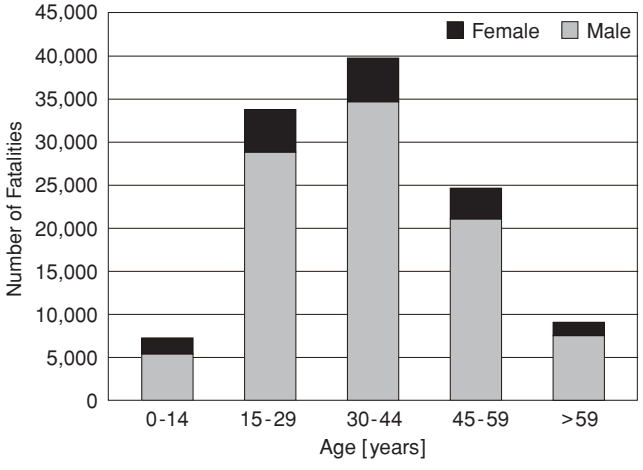
Table 4 Traffic fatalities by category of road user in Delhi and selected locations on national highways

Type of road user	Location (%)	
	Delhi 2001-2005	Highways* 1999
Truck	2	14
Bus	5	3
Car	3	15
Three-wheeled scooter taxi	3	-
Motorized two-wheeler	21	24
Human and animal powered vehicle	3	1
Bicycle	10	11
Pedestrian	53	32
Total	100	100

* The data are for 11 selected locations, and thus might not be representative for the entire country. (Tractor fatalities are not included.)

2.2 Age and gender

Figure 1 shows the distribution of road traffic fatalities in 2007 by age group and gender[3]. In 2007, only 15% of the victims were females. This is partly because of the low representation of women in the Indian workforce and exposure on roads. Children aged 14 years and younger comprise only 6% of the fatalities, though their share in the population is 32%. The proportion of fatalities in the age groups 15-29 and greater than 60 years is



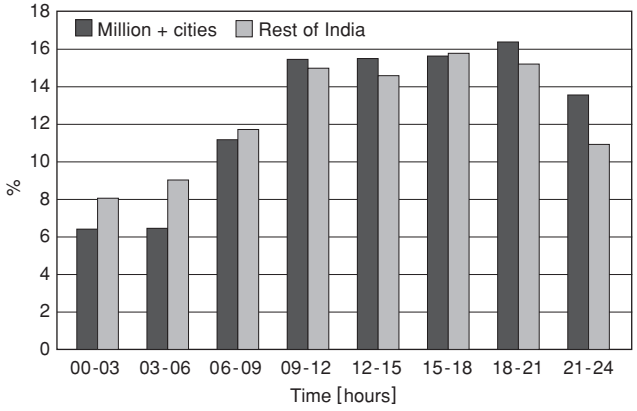
Source: National Crime Records Bureau, Delhi

Fig. 1 Traffic fatalities by age and gender, India 2007

similar to their representation in the population, but the middle-age groups 30-44 and 45-59 are over represented by about 70%. The low representation of children (2 fatalities per 100,000 persons) is curious because a significant number of children walk and bicycle to school unescorted, both in urban and rural areas. Though the exposure numbers for India are not available, children's presence on the road unsupervised is not insignificant. The reasons for the low involvement rate of children needs to be investigated.

2.3 Time of day

Figure 2 gives the proportion of fatalities by time of day in 35 large cities of India (population > 1 million) and in the rest of the country including rural roads. In the period 09:00 to 21:00 the proportions remain high and similar both in the large cities and elsewhere. In the late night hours (21:00-24:00) traffic volumes are much lower than the peak day time rates[1] but the fatality rates do not reflect this. In the early morning hours (00:00-06:00) the proportions are much lower in the large cities, but relatively higher in the rest of the country. It is possible that since the rest of the country includes national highways, the commercial goods traffic on those highways may account for this. In the absence of more detailed epidemiological data we can only surmise that the high rates at night could be due to higher speeds of vehicles when traffic volumes are lower and/or higher frequency of driving



Source: National Crime Records Bureau, Delhi

Fig. 2 Road traffic accident proportions (%) by time of day in 35 cities with more than 1 million population and those in the rest of India in 2007

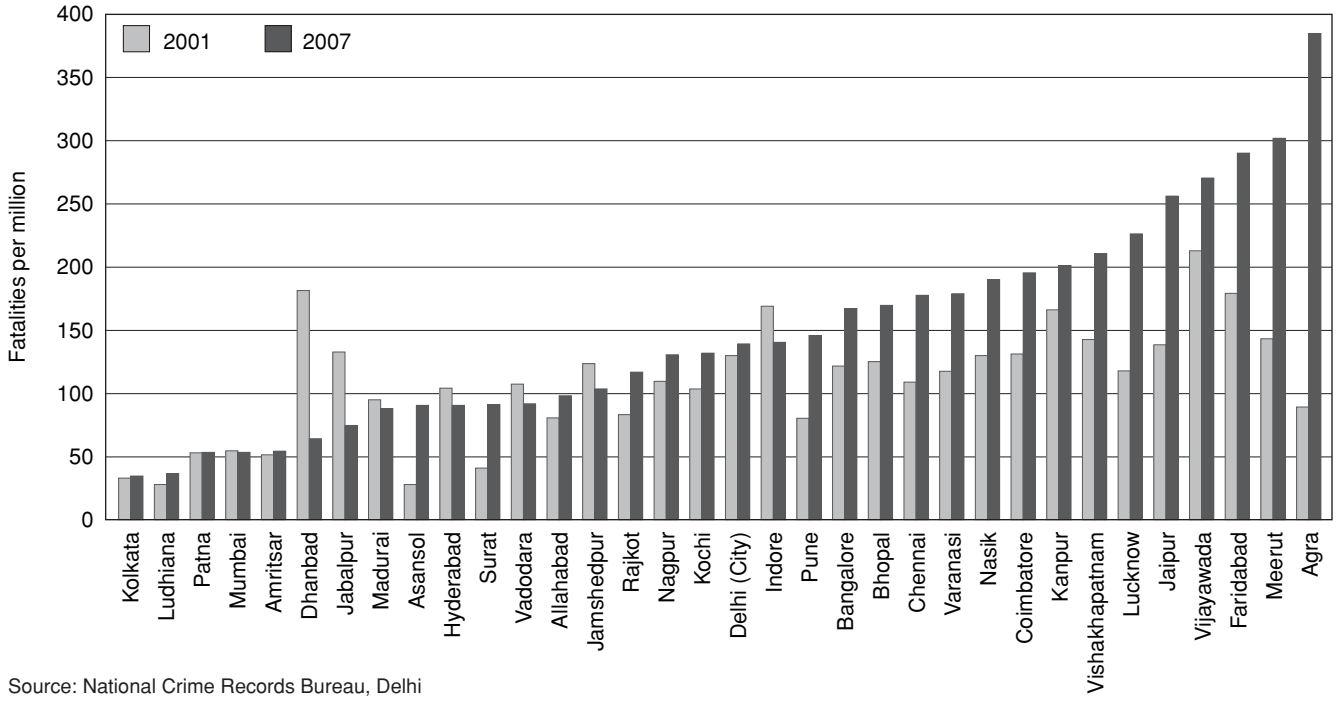
under the influence of alcohol. Evidence for increased use of alcohol comes from a hospital study in Delhi where 29% of the riders of motorized two-wheelers admitted to alcohol consumption before the crash[7]. In Bangalore, a hospital-based study showed that alcohol was involved in 22% of nighttime crashes, and that 35% of randomly checked drivers on the road at night were under the influence of alcohol[5].

2.4 Fatalities in cities with population greater than 1 million persons

Figure 3 shows the fatality rates for cities with populations greater than 1 million persons for the years 2001 and 2007[3]. Delhi had the highest number of fatalities in 2007 (1,789) with a rate of 140 per million population. The lowest rate was in Kolkata (35) and the highest in Agra (386), with an overall average of 122 fatalities per million persons for all these cities. In this period of six years, only eight of the 35 cities did not experience an increase in fatality rates. The highest increase was 433% in Asansol. Since a vast majority of the victims in these cities are vulnerable road users, one possible cause could be increases in vehicle speeds. The probability of pedestrian death is estimated at less than 10% at impact speeds of 30 km/h and greater than 80% at 50 km/h, and the relationship between increase in fatalities and increase in impact velocities is governed by a power of four[8,9]. Small increases in urban speeds can increase death rates dramatically.

2.5 Fatalities on rural highways

Detailed data are not available at the national or state level for crashes on national highways. A study collected data on modal shares, vehicle speeds, and traffic crashes on selected locations on national and state highways around the country in the late 1990s[6]. Table 4 shows the type of road users killed on highways. The study reported that trucks were the striking party in 65% of fatal crashes. Other studies report that majority of the crashes involved buses, 25% of the victims were pedestrians, rear-end crashes comprised 40% of total crashes and that crashes were increasing at a rate of 3.9% per year[10-13]. A study of road traffic crashes on a National Highway in the southern state of Kerala reported that heavy vehicles had a high involvement, and pedestrians and cyclists were 28% of the victims[14]. The most important finding of this



Source: National Crime Records Bureau, Delhi

Fig. 3 Traffic fatality rates in cities with populations of at least one million, 2001 and 2007

study is that the fatality rate per volume is more than three times higher on the four-lane section than on two-lane sections. The construction of four-lane divided highways (without access control) does not seem to have reduced fatality rates, and vulnerable road users still account for a large proportion of fatalities. There is a clear case for redesign of intercity roads with separation of slow and fast modes. The need of road users on local short distance trips will have to be accounted for. Solutions for many of these issues are not readily available and research studies are necessary for the evolution of new designs.

3. SUMMARY

Road traffic fatalities have been increasing at about 8% annually for the last ten years and show no signs of decreasing. Two modelling exercises have attempted to predict the time period when we might expect fatality rates to start to decline in a range of countries[9,15]. Cropper and Kopits predicted that fatalities in India would reach a total of about 198,000 before starting to decline in 2042 and Koornstra predicted an earlier date of 2030 for the peak traffic fatalities in India. If we assume that the present growth rate of 8% per year declines in a linear manner to 0% by 2030, then we can expect about 260,000 fatalities by 2030. Neither of these projected dates (2042 and 2030) can be accepted as road safety goals for the country.

An earlier report co-authored by the present author has a more detailed analysis of the road traffic situation in India and possible countermeasures[4]. In summary, road safety policies in India must focus on the following issues to reduce the incidence of road traffic injuries: pedestrians and other non-motorist in urban areas; pedestrians, other non-motorists, and slow vehicles on highways; motorcycles and small cars in urban areas; over-involvement of trucks and buses; night-time driving; and wrong-way drivers on divided highways. There is an urgent need to revamp police data collecting procedures so that necessary information is available for scientific analysis. India specific countermeasures will be possible through continuous monitoring and research, which will require the establishment of road safety research centers in academic institutions and a National Road Safety Board that could help move toward a safer future as outlined above.

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