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ECONOMICS OF ROAD SAFETY IN INDIA: CHALLENGES AND OPPORTUNITIES

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Abstract

The present report was designed to analyze the traffic safety situation in India, and to identify countermeasures for areas in which the total harm caused by crashes can be substantially and readily reduced. The report focuses on two aspects of traffic safety in India: challenges and opportunities. The first part of the report provides a comprehensive analysis of the current traffic safety situation in India. It is pointed out in this analysis that fatality rates have increased both on highways and in urban areas during the past few years. Based on the present analysis, the following five areas are identified as having potential for substantially reducing fatalities in India: (1) pedestrians and other non-motorists in urban areas, (2) pedestrians, other non-motorists, and slow vehicles on highways, (3) motorcycles and small cars in urban areas, (4) night-time driving, and (5) wrong-way drivers on divided highways.

Keywords: *India, road safety, transportation safety, traffic crashes, road fatalities, motorization, driving, countermeasures.*

1. Introduction

According to official statistics, 1.5 lakh people were killed in road traffic crashes in India in 2016 (NCRB, 2017). More than 90% near to 1.35 lakh road deaths in 2016 were attributed to rash and negligent driving with the latest. The situation in India has worsened in recent years. Traffic fatalities increased by about 5% per year from 1980 to 2000, and since then have increased by about 9% per year for the four years for which statistics are available. This is attributable partly to an increase in the number of vehicles on the road, and partly to the absence of a coordinated official policy to control the problem. The fatality rate has increased from 36 fatalities per million persons in 1980 to 108 fatalities per million persons in 2016.

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The total motor vehicle population has increased from about 300,000 in 1951 to about 210023289 in 2015. Most notably, motorcycles are more than five times as numerous as cars. It is also interesting that the total of buses, trucks, and other vehicles is similar in magnitude to the number of cars. These proportions of vehicle types are different from those in the high-income countries and can influence fatality rate patterns. In the U.S. in 2016, for example, passenger cars constituted 81% of vehicles on the road; trucks, and vans constituted 26%; motorcycles were only 2%; and buses 1%.The gross national income per capita in India in 2016 was US$ 1120 (or US$ 7,060 in purchasing power equivalent), while the corresponding values for the U.S. were US$ 23730 and 60,200 (World Bank, 2016).

The Indian economy has been growing at about 8% per year for the past five years and is expected to grow at an average of 8-10% per year over the next five years. Car and motorized two-wheeler sales have averaged 16% and 9% annual growth rates, respectively, over the past five years. Although the recent global economic turmoil is likely to affect sales, we can expect some level of sales growth to continue into the future. However, major increases in fuel prices are likely to have a greater negative influence on sales of cars than on sales of motorized twowheelers.

With a combination of higher investments in urban and rural road infrastructure, increasing sales of motor vehicles, and 7-10% growth rates in the economy, the trend of increasing road traffic fatalities may be exacerbated if corrective policies are not put in place on an urgent basis. The government of India has indicated its concern by accepting the Report of the Committee on Road Safety and Traffic Management, which has recommended that a National Road Safety Agency be established in India through specific enabling legislation on road safety.

2. Analysis of Data

It is clear that crash rates on intercity roads are high. 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. The presence of slow modes on highways creates serious problems, as speed differentials can account for significant increases in crash rates. High incidence of fatal rear-end crashes suggests a general lack of visibility with a possible contribution of poor conspicuity of parked vehicles. There is a clear case for redesign of intercity roads with separation of slow and fast modes.

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The needs of road users on local short distance trips will have to be accounted for to reduce the probability of head-on crashes (due to drivers going the wrong way on divided highways) by provision of continuous service lanes and safe road crossings at convenient distances. Solutionsfor many of these issues are not readily available, and research studies are necessary for the evolution of new designs.

In this section, police data for traffic fatalities are analyzed for Mumbai (population 16.4 million), Delhi (population 13 million), and Kota (population 780,000). Mumbai is the financial capital of India with the largest population, and Delhi is the political capital with the third largest population. Mumbai is an older city with a strong central business district, and is not representative of the growing megacities of modern India in terms of city form and structure. The latter, including Delhi, have grown and developed in the last four decades and have multimodal business districts. Delhi had the highest ownership of motor vehicles per capita in the country in 2004, with 6.5 cars and 13.3 motorized two-wheelers per 100 persons, and Mumbai had 2.0 cars and 3.1 motorized two-wheelers per 100 persons.

Fatality data from the city of Delhi were obtained for five years (from 2001 to 2005) from the Delhi police in the form of a consolidated spreadsheet used for preparing annual reports. The data consist of a list of incidents, identified by the time and location at which each incident occurred, the involved road user types and license plate numbers, the number of fatalities and injuries in the crash, a general categorization of the fatality by age (young/old) and gender, and whether a pedestrian was hit. The dataset provides a reliable view of some characteristics of fatalities that are not available otherwise at the state or national level. It is presented here to provide detail about the traffic situation in the capital of India, with the understanding that while Delhi is not a perfect representation of other cities and towns in India, it would reflect patterns in other large cities that have grown in the last few decades. The data for the city of Mumbai were obtained for 1996 and 1997 for a project in which police crash reports were coded specially for a detailed analysis of the road safety situation in the city (Tiwari, Mohan, and Muskaug, 1998).

Another difference between the motorized and non-motorized users is the increase in fatalities among the non-motorized users during the winter months between 17:00 and 19:00, which is not present for the motorized road users. In Delhi, sunrise and sunset are at around 05:00 and 18:30, respectively, in midsummer, and at 07:00 and 17:30 in mid-winter. These higher fatality rates could

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be due to the lack of conspicuity of pedestrians and bicyclists when the sun starts setting early in the winter.

2.1 OPPORTUNITIES: PROMISING COUNTERMEASURES

In the first part of this report, we identified six areas that, with appropriate countermeasures, are likely to bring about substantial improvements in road safety in India. These areas are (1) pedestrians and other non-motorists in urban areas, (2) pedestrians, other non-motorists, and slow vehicles on national highways, (3) motorcyclists and small cars in urban areas, (4) over-involvement of trucks and buses in crashes, (5) night-time driving, and (6) wrong way drivers on divided highways.

Pedestrians and other non-motorists in urban areas. The countermeasures with high potential for major positive effects include separation of traffic on arterial roads and traffic calming in all other areas (starting in urban areas that have the highest exposure of non-motorists to other traffic), and improvement in the pedestrian friendliness of vehicle front ends. International guidelines for traffic calming will have to be modified to incorporate designs that are effective for motorcycles as well. Speed control, use of scientifically designed roundabouts instead of traffic lights, and restrictions on free left turns (India drives on the left) are internationally used measures that reduce urban road traffic injuries. Because of the expected future partial shift in India from motorized two-wheelers to small cars (Cather, 2007), making small cars more pedestrian friendly will be of increased importance.

Pedestrians, other non-motorists, and slow vehicles on highways. The aetiology of these crashes is somewhat different from the analogous crashes in urban areas. These crashes involve conditions with higher speeds and relatively lower frequency of exposure to non-motorists. Highway designs in India will have to be modified to separate slow vehicles and pedestrians all along the highway, and provide convenient road crossing facilities at frequent intervals for local traffic. The recommended focus for the future is on in-vehicle pedestrian-detection technology and pedestrian-friendly front ends of vehicles (for crashes involving non-motorists), and forward collision warning systems and improved crashworthiness of slow vehicles (for crashes of slow vehicles with other vehicles).

Motorcycles and small cars in urban areas. The following countermeasures are recommended: required daytime running lights for motorcycles, improved lighting and signalling

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on motorcycles, enforcement of motorcyclist helmet-use laws, and motorcycle-friendly front ends of vehicles (for crashes involving motorcycles), and improved crashworthiness of small cars (for crashes of small cars). Passive measures, like mandatory airbags for all cars, may prove to be cost effective when enforcement measures are lacking.

Over-involvement of trucks and buses. Two countermeasures, aimed at the driving performance of truck drivers, are recommended: speed control by use of data loggers and GPS 48 systems, and implementation of rest regulations. Also recommended, for both trucks and buses, are safer vehicle fronts and improved vehicle conspicuity.

Nighttime driving. The available data do not allow quantification of the relative contribution of visibility, alcohol, and fatigue to the increased risk of night-time driving in India. Consequently, the recommendation is to address all of these mechanisms with a combination of countermeasures: improved head lighting and conspicuity of all vehicles (including bicycles and other non-motorized vehicles), frequent and sustained random breath testing programs, and rest regulations for truck drivers. Wrong-way drivers on divided highways. Again, the available data are not sufficiently detailed to provide information about the mechanisms that contribute to this type of crash. Nevertheless, anecdotal evidence suggests that these crashes often involve drivers who take shortcuts, often with slow vehicles such as farming equipment. In the short term, enforcement is the key approach for addressing this phenomenon. Research needs to be undertaken to understand the needs of local traffic and to develop standards for safer road crossings and the frequency at which they need to be provided. Additionally, collision warning systems would also contribute to a reduction of this type of crash.

3. SUMMARY

The present report was designed to analyze the traffic safety situation in India, and to identify countermeasures that would address areas in which the total harm caused by crashes can be substantially and readily reduced. The report focused on two aspects of traffic safety in India, challenges and opportunities. The first part of the report provided a comprehensive analysis of the current traffic safety situation in India. It was pointed out in this analysis that fatality rates have increased both on highways and in urban areas during the past few years. Theoretical models suggest that the number of fatalities in India is not likely to start to decline for many years to come

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non-motorists, and slow vehicles on highways, (3) motorcycles and small cars in urban areas, (4) over-involvement of the current traffic safety situation in India. It was pointed out in this analysis that fatality rates have increased both on highways and in urban areas during the past few years. Theoretical models suggest that the number of fatalities in India is not likely to start to decline for many years to come unless new policies are implemented. Based on the present analysis, the following six areas were identified as having potential for substantially reducing fatalities in India: (1) pedestrians and other non-motorist in urban areas, (2) pedestrians, other non-motorists, and slow vehicles on highways, (3) motorcycles and small cars in urban areas, (4) over-involvement of trucks and buses, (5) night-time driving, and (6) wrong-way drivers on divided highways.

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