Chapter 2
The Potential for Rail Transit as a Way to Mitigate Accident Risk: A Case Study in Chennai

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ABSTRACT

The city of Chennai has made road accident data available with the address location of road accidents and the total numbers of persons and pedestrians affected in the accident in 2009. These data were geocoded to locate the accidents with respect to the census wards within the Chennai Corporation area. Both the total number of persons as well as pedestrians in accidents as well as the rate of accidents normalized by population in the ward were modeled as dependent variables using Poisson based regression models to see the effect of location characteristics such as road length, vehicle traffic, proximity to existing and proposed transit infrastructure and the percentage of the land developed between 1991-2009. The results from the models suggest that location does indeed affect the risk for accidents in Chennai and that planners in the city may need to better understand the implications of roads, urban development, transit access and the built environment for traffic safety.

INTRODUCTION

The World Health Organization (WHO, 2009) estimated that 1.2 million people a year die and 50 million are injured in traffic accidents and that a majority of these accidents occur in low income countries. Mohan et al (2009) report that traffic fatalities in India increased by about 5% per year from 1980 to 2000, and have continued to increase by about 8% per year since then. After New Delhi (the capital of India), in 2006 Chennai had the highest fatality rate from accidents with over 1300 fatalities in that year alone (Mohan et al, 2009). There are significant geographical and socioeconomic disparities in the risk of traffic accidents related injuries. A national survey of road traffic injuries in India found that the age-adjusted mortality rate was greater in urban than in rural areas, and was notably higher than that estimated from national police records (Hsiao et al, 2013). The found that pedestrians, motorcyclists

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and other vulnerable road users constituted 68% of the deaths due to road traffic accidents and 81% of pedestrian deaths were associated with less education and living in poorer neighborhoods. Hsiao et al also note that the state of Tamil Nadu (of which Chennai is the capital) had the third highest death rate in the country due to road traffic injuries. Patel et al (2011) found that rapid motorization, along with the heterogeneous composition of road traffic and infrastructural deficiencies can be directly linked to the increased number of road traffic injuries in India. They report that more than half of total road deaths in 2007 were in Andhra Pradesh, Maharashtra, Tamil Nadu, and Karnataka, which account for only 27% of India’s population but about 37% of its motor vehicles. Research suggests that the overall fatality rates are likely to continue to increase as GDP continues to increase and motorization increases (Grimm and Treibech, 2012). These grim statistics also have implications for the economy. Yearly losses due to road traffic accidents have been estimated at 750 billion rupees (Sikdar and Bhavsar, 2009). This was nearly 3% of the gross domestic product (GDP). In the light of these grim statistics it is vital that we address traffic accidents as a major health burden especially in urban areas where residents face a higher risk.

Many studies in India have focused on traffic accident risk at the scale of states, regions and cities. Very few studies have looked at risk within the city. It is important to look at both macro level and micro level policies to be able to address the risk of accidents at different scales. While macro level policies are necessary for traffic safety micro-scale policies can be used by urban planners within cities. Among the few Indian studies that address this within cities – Tiwari and Jain (2014) estimate a 43% reduction in accidents along the Bus Rapid Transit (BRT) corridor in New Delhi suggesting that access to transit may play a role in reducing the risk of accidents. De Andrade et al (2014) observed in Brazil that the built environment has a direct influence on the occurrence of accidents, as well as the specific behaviors that causes them. In their built environment analysis, the variables length of road in urban area, limited lighting, double lane roadways, and fewer auxiliary lanes were associated with a higher incidence of fatal accidents. Harvey et al (2015) estimated regression models for New York City that suggest that vehicle accidents on smaller, more enclosed streetscapes were less likely to result in injury or death compared with those on larger, more open streetscapes. Hanson et al (2013) also suggest that severity of pedestrian casualties is associated with the lack of sidewalks and buffers, high-speed roads, roads with six or more lanes and a median, and lack of traffic lighting. Clifton et al (2011) note that transit access and greater pedestrian connectivity, such as central city areas, are significant and negatively associated with injury severity. Ewing et al (2013) have found that for the US urban sprawl is both directly and indirectly a significant risk factor for traffic fatalities suggesting that the built environment may play a role in accident risk. Demographic factors may also play are role in accident risk: researchers in developed countries like the UK have found that find that economically deprived areas within urban areas tend to have higher levels of casualties due to road traffic (Noland and Quddus, 2005; Anderson, 2010). A study by Cottril and Thakuriah (2010) in the US notes that pedestrian-vehicle crashes are more common in locations with high low-income and minority populations (also called environmental justice or EJ areas in the United States). They find that pedestrian traffic accidents in EJ areas are related to variables of exposure (including the suitability of the area for walking and transit accessibility), transit availability, and general population demographics such as income and the presence of children.

As India continues to urbanize a greater proportion of the population will be exposed to the risk of accidents. Therefore it is useful to understand the risk of accidents within an urban context. In this chapter we study the geographic distribution of traffic accidents within the city of Chennai and estimate the probability of accidents while controlling for socioeconomic and built environment characteristics.