How does the built environment influence pedestrian activity and pedestrian collisions at intersections?

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Ahmed El-Geneidy, PhD, Assistant Professor
School of Urban Planning McGill University

1. PROBLEM STATEMENT AND OBJECTIVES

1.1 Background and Objectives

Every year, a large number of pedestrians are killed or seriously injured in crashes involving motor vehicles. In Canada, for instance, between the years 2003 and 2006, 1,639 pedestrians were killed, comprising approximately 13% of total road user fatalities. In addition, around 25,200 were seriously injured. To address this problem, local government and urban transportation agencies, not only in Canada but also in other countries around the world, have identified the safety and mobility of pedestrians as high priorities. To this end, investments are constantly allocated by different government agencies, not only in Canada but also in other countries around the world. The aim of this paper is to two-fold: to present a framework that is useful for the identification of effective pedestrian safety actions, the prediction of pedestrian deaths when data is lacking, and the appropriate design of new developments encouraging walkability. In accordance with previous studies, our results show that the built environment has a significant impact on pedestrian activity. Such results support the idea of retrofitting transportation infrastructure to provide some additional evidence that traffic volume is the primary cause of pedestrian safety action. A strong link between the number of injuries and the length of the pedestrian-pedestrian collision. However, with no supplementary strategies, the improvement of the pedestrian-pedestrian collision frequency is low, measured as a reduction of 50% in the total number of injured pedestrians.

1.2 Built Environment and Pedestrian Activity

The built environment can be defined as the physical and social settings that influence human behavior. This definition is broad, encompassing a wide range of factors, from the design of individual buildings to the layout of entire cities. The built environment can affect pedestrian activity in several ways, including by providing safe and convenient facilities for walking, promoting active transportation modes, and creating physical obstacles that discourage walking. For example, well-designed streets and sidewalks can encourage pedestrians to walk, while poorly designed streets and sidewalks can discourage walking. Similarly, the presence of bike lanes and other facilities for active transportation modes can encourage walking, while the absence of such facilities can discourage walking.

2. LITERATURE REVIEW

This section provides a brief review of the literature on the relationship between the built environment and pedestrian activity. It highlights the role of the built environment in influencing pedestrian activity and collision frequency, and discusses some of the factors that have been studied in previous research. The review is focused on studies that have examined the built environment and pedestrian activity at the intersection level. This modeling framework has been developed to jointly analyze pedestrian activity and safety at the intersection level. This modeling framework is useful for the identification of effective pedestrian safety actions, the prediction of pedestrian deaths when data is lacking, and the appropriate design of new developments encouraging walkability. In accordance with previous studies, our results show that the built environment has a significant impact on pedestrian activity. Such results support the idea of retrofitting transportation infrastructure to provide some additional evidence that traffic volume is the primary cause of pedestrian safety action.

3. DATA FOR EMPIRICAL ANALYSIS

Table 1 presents the list of variables and their categories. The built environment variables are classified into four categories: land use, transit services, road network, and traffic signals.

4. METHODOLOGY

4.1 Conceptual Framework

A conceptual framework is developed to analyze the relationship between the built environment and pedestrian activity. The framework is useful for the identification of effective pedestrian safety actions, the prediction of pedestrian deaths when data is lacking, and the appropriate design of new developments encouraging walkability.

4.2 Empirical Analysis

4.2.1 Pedestrian Activity Model

For a given intersection, the concept framework is used to estimate the dependent variable pedestrian activity. The pedestrian activity model is specified in Eq. 1, a negative binomial regression model is then carried out to estimate the impact of the built environment variables on pedestrian activity. The dependent variable is the number of pedestrian activity events at the intersection level. The independent variables are classified into four categories: land use, transit services, road network, and traffic signals.

5. RESULTS AND DISCUSSION

5.1 Pedestrian Activity Model

The results presented in Table 2 show that the built environment variables have a significant impact on pedestrian activity. The variables that have a statistically significant effect on pedestrian activity are classified into four categories: land use, transit services, road network, and traffic signals.

6. POLICY IMPLICATIONS

Different practical implications can be supported from our findings. A strong link between the number of injuries and the length of the pedestrian-pedestrian collision frequency is low, measured as a reduction of 50% in the total number of injured pedestrians.