

Micro-Level Analysis to Determine Elderly Pedestrian Crash Risk and Related Built Environmental Factors

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The global surge in the elderly population has intensified concerns about their safety, particularly as pedestrians. Age-related physical changes render them more susceptible to various dangers, which are implicated in nearly 40% of traffic fatalities worldwide. Furthermore, the existing road infrastructure, primarily designed for younger pedestrians, may not adequately address the safety requirements of older people. Previous studies have often treated older people as a homogeneous group, disregarding variations in their capabilities. Additionally, limited research has integrated micro-level built environmental factors (e.g., points of interest) and spatial models.

To address these research gaps, we categorize the elderly population into three age-based subgroups and center our investigation on road intersections as the study unit. By employing the Multiscale Geographically Weighted Regression (MGWR) model, we analyze crash risks and the associated built environmental factors contributing to 2276 crashes in Taipei City.

The results reveal distinct crash-related factors linked to different age groups of elderly pedestrians: (1) Among those aged 65-74, crash risk significantly correlates with the number of convenience stores and subway stations. (2) In the 75-84 age group, the crash risk positively correlates with schools, supermarkets, and train stations. (3) Finally, a significant positive association emerges between crash risk among those aged 85 and over and the number of hospitals. Furthermore, the relationship among these variables exhibits spatial variations, indicating the diverse influences on the safety of elderly pedestrians.

Keywords: elderly pedestrians crash risk, multiscale geographically weighted regression (MGWR), points of interest (POI)