

Latent class clustering of cyclist-motorist crash patterns in Denmark

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The current study aims to uncover patterns of cyclist-motorist crashes in Denmark and to investigate their prevalence and severity. The importance of implementing clustering techniques for providing a holistic overview of vulnerable road users' crash patterns derives from the need to prioritize safety issues and devise efficient preventive measures. In order to uncover crash patterns, the current analysis applies latent class clustering, an unsupervised probabilistic clustering approach that relies on the statistical concept of likelihood and allows partial overlap across clusters. The analysis yielded 13 distinguishable cyclist-motorist latent classes. Specific crash patterns for urban and rural areas were revealed. Two clusters involve crashes in rural area with and without helmets, and the remaining clusters involved cyclist-motorist crashes in urban areas where the speed limit is 50 km/h. Distinguishable features across clusters in urban areas are speed limits, infrastructure type (i.e., roundabouts, intersections), road surface conditions and number of lanes, motorized vehicle pre-crash maneuvers, availability of a cycling lane, cyclist intoxication, and helmet wearing behavior. The latent classes differ with respect to their associated cyclists' injury severity level. The results show that the latent classes clustering approach provides a comprehensive and clear map of cyclist-motorist crash patterns. The results are useful for prioritizing and resolving safety issues in urban areas, where there is a significant share of cyclists potentially involved in multiple hazardous situations or where extensive bicycle sharing programs are planned. Policy implications are drawn for cycling network design and connectivity, road maintenance, and educational campaigns for road behavior of cyclists and motorists.

Keywords: Bicycle Crashes; Cyclist-Motorist Crashes; Cyclists' Injury Severity; Latent Class Clustering.