

ANALYSING FACTORS ASSOCIATED WITH CASUALTY SEVERITY IN ROAD TRAFFIC ACCIDENTS: A GENERALISED LINEAR MODELING APPROACH

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Road traffic accidents remain a significant public health challenge in Sri Lanka, necessitating a comprehensive understanding of factors contributing to casualty severity. This study investigates the determinants of the number of casualties per road traffic crash in the Kandy Police Division using generalised linear modelling (GLM) with a Poisson distribution. This study was based on the analysis of 2,099 crashes recorded from January 2022 to March 2024. A log-linear model was initially fitted with a comprehensive set of predictors, including environmental, temporal, vehicular, and collision-related variables. Model selection was conducted using stepwise Akaike Information Criterion (AIC) based variable elimination as AIC balances model fit and complexity. This process produced a simplified model with improved interpretability and minimal loss of explanatory power (AIC = 5,229; likelihood ratio test $\Delta D = 18.42$, $df = 20$, $p = 0.559$). The estimated dispersion parameter was 0.673, indicating no evidence of overdispersion and supporting the suitability of the Poisson framework. Key predictors retained in the final model included road surface condition, traffic control status, vehicle type, collision type, urban versus rural location, and the number of vehicles involved. Crashes involving motorcycles and three-wheelers showed elevated casualty risks, with rate ratios of 1.28 and 1.21, respectively, compared to cars. Passenger-involved collisions were associated with a 2.75-fold increase in casualties ($p = 0.002$), while pedestrian involvement led to a 91% increase ($p = 0.038$) relative to collisions with stationary objects (baseline). Wet road surfaces and the absence of traffic control mechanisms were associated with increased risks of approximately 14% and 16%, respectively. The number of vehicles involved also showed a positive association with casualty count (rate ratio = 1.27). The average number of casualties per incident was 1.12, while the variance was 0.76, further validating model adequacy. These findings highlight key influences on injury severity and provide evidence-based insights to assist authorities and policymakers in planning effective road safety interventions.

Keywords: Casualty modeling, Injury risk factors, Log-linear model, Poisson regression, Road safety