Safety Effects of Horizontal Curve Design on Motorcycle Crash Frequency on Rural, Two-Lane, Undivided Highways in Florida

Abstract

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The association between horizontal curve design (e.g., radius and type) on rural, two-lane, undivided highways and motorcycle crash frequency is not well documented in existing reports and publications. This study aimed to investigate the effects of design parameters and associated factors on the occurrence of motorcycle crashes with consideration of the issue of unobserved heterogeneity.

A random-parameters negative binomial regression model was developed on the basis of data on 431 motorcycle crashes, which were collected on 2,179 horizontal curves along two-lane, undivided highways in Florida for 11 years (2005 to 2015). Four normally distributed random parameters (i.e., logarithm of curve radius, reverse curves, pavement condition, and rough pavement indicator) were identified to represent their heterogeneity caused by unobserved factors over time, space, individuals, or some combination thereof.

The major conclusions are the following: (a) an increase in curve radius, on average, significantly and near-logarithmically reduced motorcycle crash frequency on rural, two-lane, undivided highways (this effect was more significant when the curve radius was less than 2,000 ft); (b) 74.8% of reverse curves tended to reduce motorcycle crash frequency on rural, two-lane, undivided highways (for the remaining 25.2%, the effect had an opposite effect; on average, the likelihood of motorcycle crashes on reverse curves decreased by 39%); (c) the crash modification function (CMF) for curve radius on rural, two-lane, undivided highways was established, given the radius of 5,000 ft as the baseline, as a power formula, CMF = (radius/5,000)-0.208.