Investigating the Vulnerability of Motorcyclists to Crashes and Injury

Motorcyclists are fatally injured 25 to 30 times more frequently than passenger vehicle occupants after accounting for vehicle miles traveled. This project uses the Injury Severity Score (ISS) as a response variable and focuses on a unique database of motorcycle crashes, the federally collected Motorcycle Crash Causation Study (MCCS), to explore the role of demographics and how key risk factors vary from one context to another, i.e., the settings in which motorcycle travel takes place.

This study conducts a rigorous heterogeneity-based case-control analysis to account for both within and between matched case-control variations.

The project addresses critical safety issues related to motorcyclists:
- Motorcycle crash risk factors, especially how visual conspicuity (bright-colored or reflective clothing) relates to crash involvement
- How the helmets (types and fit) impact riders
- How training and education programs relate to crash outcomes

The results show that several key factors have substantial correlations with crashes and injuries. The risk of injury crash was significantly higher for riders lacking conspicuity. Furthermore, if riders were wearing motorcycle-oriented shoes, their injuries were lower. And crash risk was lower for riders who had recently received training. The analysis of ISS provided deeper insights about the nature of injuries and showed that properly fitting helmets lowered injury severity. However, partial helmet coverage was associated with higher injury, which is intuitive as such helmets provide less coverage compared to full face helmets and thus pose a higher risk of injury. One implication can be to design helmets that have broader coverage, but also allow the rider to hear and see well.

In the future, researchers can simultaneously model the injury sustained by different body parts of the same rider to fully capture severity and account for unobserved heterogeneity. Also, one may examine the occurrence and outcomes of motorcycle crashes once connected and automated vehicle technology diffuses more fully through the system.

PRINCIPAL INVESTIGATOR
Asad Khattak, Ph.D.
UNIVERSITY OF TENNESSEE, KNOXVILLE

LEARN MORE
www.roadsafety.unc.edu/research/projects