A Spatial Analysis of Land Use and Network Effects on Frequency and Severity of Cyclist-Motorist Crashes in the Copenhagen Region - DTU Orbit (09/08/2019)

Objective: Urban and transport planners worldwide have recently designed and implemented policies for increasing the number of cyclists. Although cycling is on the rise even in car-oriented cities and regions, the fear of being involved in a crash is still the main obstacle to further increases in cycling market shares. The current study proposes the first joint model of frequency and severity of cyclist-motorist collisions with the aim of unraveling the factors contributing to both the probability of being involved in a crash and, conditional on the crash occurrence, experiencing a severe injury outcome.

Method: A multivariate Poisson-lognormal model with correlated autoregressive priors was estimated on a sample of 5,349 cyclist-motorist crashes that occurred in the Copenhagen region between 2009 and 2013. The model considered the links of the road network in the region as the unit of observation, controlled for traffic exposure of nonmotorized and motorized transport modes, evaluated the effect of infrastructure and land use, and accounted for heterogeneity and spatial correlation across links.

Results: Results confirmed the existence of the phenomenon of safety in numbers and added to the narrative by emphasizing that the most severe crashes are the ones most benefiting from an increase in the number of cyclists. In addition, results argued that the construction of Copenhagen-style bicycle paths would significantly contribute to increasing safety, especially in suburban areas where the speed differential between cyclists and motorists is greater. Last, results illustrated a need for thinking about cycling safety in intersection design and reflecting on the importance of spatial and aspatial correlation both within and between injury categories.

Conclusions: The findings from this study illustrated how encouraging cycling would increase safety in relation to the phenomenon of safety in numbers and how, in turn, increasing safety would convince more people to cycle. In addition, they suggested how the design of bicycle infrastructure should not only consider bicycle lanes but in particular focus on bicycle paths where the number of conflicts and the stress for sharing the road are highly reduced and how thinking about road design should extend to the general level and include a discourse about safer intersections. Last, attention should be given to the road design in the city center and to traffic management, because clearly safer traffic implies more cyclists and, in turn, more cyclists imply fewer cars and less congestion.