

Cycling on Rural Roads in North Carolina

A Look at Injury Severity and Crash Types on Rural Roads in Comparison to Urban Roads

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This paper examines the causes and severity of rural motor vehicle-bicycle collisions in North Carolina. Recreational cycling is growing along with the growth in the number of cyclists on public roads overall, and in many parts of the country greater numbers of men and women are spending their time riding on rural roads. Rural cycling has been at the center of recent state and county level conversations surrounding road safety laws and best practices with regards to cyclists and motorists 'sharing the road' in North Carolina [1]. Sweeping new regulations were discussed and considered on a statewide level. However, discussion regarding cyclist safety on North Carolina roads should begin with a close examination of which motorist- cyclist interactions have, historically, caused a high number of crashes, coupled with a look at where these crashes tend to occur, and in which contexts crashes resulted in the most severe injuries. Countermeasures and safety campaigns have been shown to work best when targeted to specific behaviors, and we believe that examining the crash data and highlighting the trouble spots is an essential step for transportation officials, policy makers and advocates focusing their efforts to enhance safety [2].

Rural cycling crashes have been shown to be more severe in general. When compared to urban environments, rural roads have fewer intersections, higher speed limits, and less bicycle infrastructure. Consequently, crashes in rural settings have different implications than those in urban settings. Past studies have also highlighted the association of greater injury severity and rural settings [3]. The study 'Bicyclist Injury Severity in Bicycle – Motor Vehicle Accidents' looked at motor vehicle speed as a predictor of injury severity from cycling crashes. Speed was determined to increase the likelihood of fatality, and speeds of over 50 miles per hour increased the likelihood of fatality by over 16 times [4].

Our analysis focuses on the contrasting frequencies of specific motor vehicle bicycle crash types in rural areas versus in urban areas in the state of North Carolina from 2008 – 2013 and examines the injury severity differences resulting from the kinds of crashes occurring more often rural areas as compared to urban areas. In the six-year time-frame we studied, an average of 25 cyclists per year were fatally injured in crashes with motorists on North Carolina’s roads. Of the 149 cyclists killed in North Carolina during the 6 years, 69 of them were killed in a ‘motorist overtaking cyclist’ crash, and over half of those deaths occurred in rural settings.

Our work reveals statistically significant differences in injury severity in rural areas as compared to urban, and in the frequency of the top three types of crashes in rural or urban settings. Injuries tended to be more severe in rural areas, and the top crash type, ‘motorist overtaking cyclist’, occurred more frequently in rural areas, while the second and third most common crash types, ‘motorist failing to yield, signed controlled intersection’ and ‘motorist left turn/ merge’, both occur more often in urban areas. Consistent with previous research and our hypothesis, our analysis showed that a higher percentage of severe crashes occur in the rural settings as compared to urban settings.

Using historical crash data from actual motorist-cyclist crashes that have occurred in North Carolina, we clearly show which on-road conflicts result in the most crashes, and in which type of environment certain types of crashes happen more frequently. We have also shown which spatial environment tends to result in the worst outcomes. Out of over 6500 crashes in six years, one type of crash stands out. The action of a ‘motorist overtaking cyclist’ crash is not only the most common crash period, but it occurs most frequently in a rural environment. In that same environment, crashes also lead to greater injury severity. Conversely, motorists failing to yield at a signed controlled intersection, or motorists turning left into the path of a cyclist, the number two and three most common crashes overall, respectively, are both significantly more common in towns and cities.

In 2016, North Carolina updated its cycling laws to include new regulations aimed at increasing cyclists’ safety, including a new law allowing motorist to cross the yellow line when passing a cyclist, and advocates on multiple sides of the issues are asking lawmakers to do more [5]. A wide variety of suggestions for future amendments to state cycling laws are being put forward and there is heated debate on whether some proposals would substantively improve safety (Riegel, 2016). This study seeks to enable a more data driven approach towards creating road safety policy. By focusing on the rural versus urban setting, we sought to illustrate the difference in injury severity and the types of crashes that occur in these two environments.

Ultimately, in both injury severity and crash types, stark contrasts between urban and rural environments were evident, and for the safety of many North Carolinians, policy response to the number of cycling crashes should reflect these differences. Evaluations such as this one should go a long way towards informing efforts to increase safety for all road users on North Carolina roads. Policymakers, having assessed the results shown in the data, should seek to apply tailored laws and regulations to each setting and avoid any “one-size-fits-all” solutions.

In order to improve safely for cyclists in the rural setting, we need to end the predominance of the motorist ‘right to speed’ concept and stop promoting “increased motor vehicle speeds over safe and equitable access for low energy vehicle users” [6]. NCDOT should install ‘Bikes May Use Full Lane’ signs on rural roads, and implement comprehensive education programs surrounding North Carolina’s new passing laws. Speed Limits

should be reduced and enforced, especially on rural roads which see heavy cycling traffic, and penalties for motorists who kill or injure cyclists should be stiffened. Future fatalities and injuries such as those that occurred in our state between 2007 and 2013 can be prevented, but we need clear and enforceable policies which protect the more vulnerable road users and not those which contribute to their further marginalization.

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