

WINTER 2013

THE UNIVERSITY OF NORTH CAROLINA
HIGHWAY SAFETY RESEARCH CENTER

DIRECTIONS

SAVING LIVES, REDUCING INJURIES

North Carolina's motorcycle
helmet requirement

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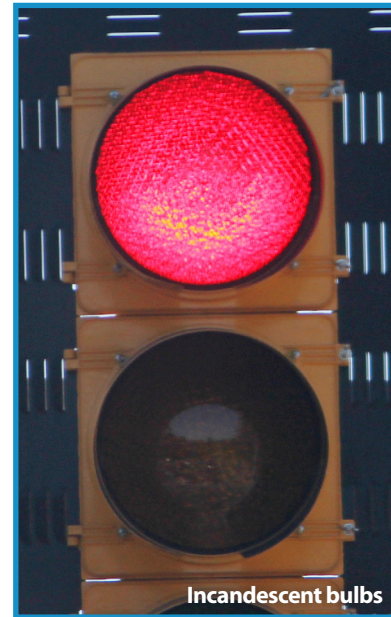
HSRC researchers study safety effects of traffic signal cost-saving measures

LED traffic signals

Across the nation and here in North Carolina, transportation agencies have increasingly been converting the bulbs in our traffic signals from incandescent bulbs to light emitting diode (LED) bulbs. Much of this is driven by a requirement by the Department of Energy to meet ENERGY STAR requirements; however, LEDs are also a popular choice because they decrease costs by using less energy and because they have a longer life, requiring less maintenance.

While agencies are not typically making this change on the basis of expected safety benefits, they certainly are not expecting intersection safety to be compromised. “Surprisingly, two prior studies in Ohio and Tennessee found that LED bulbs significantly increased crash rates – one study found an increase of 71 percent and the other, 47 percent,” said UNC Highqay Safety Research Center (HSRC) researcher Raghavan Srinivasan. “When you have results so dramatic, questions are raised.”

Because of these studies’ small sample sizes and other methodological limitations, HSRC researchers Srinivasan, Daniel Carter, Sarah Smith and Bo Lan decided to take their own look, a before-and-after analysis with a larger volume of data. They collected data from 282 LED signalized intersections in Charlotte, N.C., and more than 3,000 intersections in a comparison group. The team found



The HSRC study showed no significant decrease in safety, and one possible increase, when replacing incandescent bulbs in traffic lights with LED ones.

that, at three-leg intersections there was no significant change in safety performance before and after the LED installations. At four-leg intersections, crash modification factors (CMF) for rear end crashes are lower than 1.0 and statistically significant, indicating a safety benefit for this crash type after the signals were converted to LEDs. The CMFs for other types of crashes at four-leg intersections were not statistically significant.

Srinivasan indicated that “there were substantial differences among the study sites in terms of the safety effects of the LEDs, which would call for future research to investigate whether LEDs are more or less beneficial depending on the characteristics of the intersection.”

Srinivasan says that characteristics of the intersection could include type of area, sight dis-

tance, traffic volume, presence of intersection lighting, and phasing scheme. Additionally, researchers in northern states should consider the effect of weather conditions – since LEDs do not emit heat, it has been reported that snow on and around the lights does not melt, sometimes blocking the view of the signal.

Late night flash operations

A second HSRC traffic signal study by Lan and Srinivasan found that converting late night flashing (LNF) operation to normal phasing operation resulted in a 48 percent reduction in total nighttime crashes, a 53 percent reduction in nighttime crashes resulting in injury and fatalities, and a 57 percent reduction in nighttime frontal impact crashes.

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LNF operation is a practice in which traffic signals are operated in “flashing mode” when traffic volumes are low, typically during late night or early morning hours. Usually a flashing yellow signal is used to indicate “caution” on the major street and a flashing red signal is used on the intersecting minor street, which requires the driver to stop and proceed after yielding to traffic on the major road.

“While LNF flash operations saves electricity costs and reduces delay to drivers, it gives drivers the responsibility of looking for other traffic, and errors can happen,” said Srinivasan. “Removing such operations may cost drivers a little more time in some cases, but will improve safety.”

Previous studies also supported this conclusion, but the magnitude of crash reduction varied significantly (from 27 percent up to 78 percent fewer crashes) between studies. Using data for 61 intersections that were converted from LNF to normal phasing operation and 395 intersections that remained on LNF operation from 2000 to 2007, Lan and Srinivasan were able to develop more precise estimates of the crash reduction effects when LNF operations are removed.

Both traffic signal studies were funded by the Federal Highway Administration through the Highway Safety Information System project, were presented at the 2013 meeting of the Transportation Research Board, and will be published in the Transportation Research Record later this year.

National Bike to School Day: Registration now open

Wheels are in motion for the second annual National Bike to School Day! The National Center for Safe Routes to School recently opened registration for the celebration on Wednesday, May 8. Schools, community members and parents can register a Bike to School Day event now at www.walkbiketoschool.org. Registering a Bike to School Day event provides organizers access to a variety of downloadable materials, including stickers, certificates, badges and classroom activities. Registrants will also be entered into drawings for Saris bicycle parking racks.

Bike to School Day is a national event that gives communities across the country the opportunity to join together in bicycling to school on the same day. The event, an exciting celebration for both those new to the experience and those who have been two-wheeling to school for years, is part of the movement for year-round safe routes to school, and encourages

bicycling to school as a healthy way for kids and families to make their school commute

Nearly 950 schools across the country participated in the inaugural national event in 2012, and participation is expected to increase for the 2013 celebration. As it did in 2012, the second annual National Bike to School Day builds on the excitement surrounding National Bike Month, led by the League of American Bicyclists each May, and builds off the 16 years of success of International Walk to School Day.

New this year, in addition to being part of National Bike Month, Bike to School Day is part of an international movement called Global Youth Traffic Safety Month. The goal of this effort is to engage and empower youth across the globe to develop and implement youth peer to peer education projects, support increased enforcement of traffic laws and advocate for stronger laws to protect young people on the roads.



Nearly 950 schools (like this one in Vista del Sur, Ariz.) participated last year.

North Carolina's motorcycle helmet requirement: Saving lives, reducing injuries

Motorcycle crashes have been increasing in North Carolina – in 2010, there were 4,240 crashes involving motorcyclists in North Carolina, up from 2,541 crashes in 2001. Although crashes have increased, the proportion of riders who die when they crash has remained the same, largely because virtually all riders in North Carolina wear helmets. Researchers Rob Foss, Bevan Kirley and Arthur Goodwin collaborate on motorcycle research at the UNC Highway Safety Research Center (HSRC) and answered our top questions.

Q. How effective are helmets in reducing motorcycle crash fatalities and injuries?

A. Motorcycle helmets are very effective in reducing injuries and fatalities. According to the Centers for Disease Control (CDC), helmets reduce the likelihood of death in a motorcycle crash by 37 percent, and reduce the likelihood of head injury by 69 percent. That's a big deal, especially when considering that hospital charges are 13 times higher for crash-involved motorcyclists who have a traumatic brain injury compared to those who don't.

Q. Do most states require motorcyclists to wear helmets?

A. Right now, 19 U.S. states have universal helmet laws. These laws require every motorcycle rider and passenger to wear a helmet, every time they ride, regardless of age. Twenty-eight states have partial helmet laws



According to the CDC, motorcycle helmets reduce the likelihood of death in a motorcycle crash by 37 percent and likelihood of head injury by 69 percent.

covering only riders of certain ages, usually the youngest riders. Three states do not have a motorcycle helmet law. North Carolina has had a universal law in place since 1968. If we can toot our own horn, a recent CDC report found that North Carolina was number one in the nation for both lives saved and economic costs saved by motorcycle helmet use.

Q. Are helmet laws effective when they only apply to young riders?

A. No, they're not. Research has shown there is a 37 percent increase in risk of traumatic brain injury among young riders in states with partial helmet laws compared to states with universal coverage. Additionally, CDC looked at fatal motorcycle crashes from 2008 to 2010. In states with universal helmet laws, only 12 percent of fatally injured motorcyclists were not wearing helmets. By comparison, 64 percent of riders were not wearing helmets in states

with partial helmet laws, and 79 percent of riders were not wearing helmets in states without helmet laws.

Q. Does helmet use change when a state passes a universal helmet law?

A. The research on that one is clear. When a state moves to a universal helmet law, we see big increases in helmet use among motorcycle riders. For example, when Nebraska passed their universal helmet law, helmet use increased from 15 percent before the law to 85 percent afterward. Other states such as California, Louisiana, Maryland and Washington also saw large increases in helmet use after enacting a universal helmet use requirement.

Q. What about the opposite? What happens when a state repeals its universal helmet law?

A. Then we see the reverse pattern. Florida is a good example.

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When states enact universal helmet laws, helmet use increases dramatically. When the laws are repealed, it has the opposite effect.

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Motorcyclist helmet use in Florida was 99 percent when the state had a universal helmet law. After they moved to a partial helmet law, helmet use dropped to 53 percent. Not surprisingly, there was a 55 percent increase in motorcycle rider deaths after the helmet law was repealed, and the costs of treating head injuries from motorcycle crashes more than doubled. Motorcycle fatalities even went up among riders under the age of 21 who were still covered by the law.

Q. Do motorcycle riders support universal helmet laws?

A. Yes. We looked at approval of North Carolina's helmet law in a 2012 telephone survey of 600 residents. Among respondents who had ridden a motorcycle during the past year, 78 percent support the helmet requirement.

Among non-motorcyclists, nearly all – 93 percent – favor the requirement.

Q. What else can be done, in addition to requiring helmet use, to keep motorcyclists safe?

A. Right now, helmets are the only proven way to improve motorcycle safety. A number of other efforts have been tried such as training for new or experienced riders, programs to make drivers more aware of motorcyclists, and anti-drinking and riding campaigns. There is no evidence that any of these efforts reduce motorcycle crashes or deaths.

Q. What motorcycle safety issues are you currently researching?

A. We recently completed a study looking at motorcycle crashes in the western part of North Carolina. That part of the state is mountainous, and it's a

popular destination for motorcycle riders given the many two-lane winding roads and beautiful scenery. We examined the motorcycle crash rate on some of the most popular roads among the motorcycling community, and compared them to other similar roads that aren't as well known. We also conducted interviews with more than a hundred motorcyclists and carried out observations of several thousand others. We found that certain roads are more dangerous than might be expected, that inexperience riding in mountainous terrain may be a problem, and that this will be a difficult issue to address because so many riders in the North Carolina mountains come from other states. On the bright side, it's worth noting that 100 percent of the motorcyclists we observed during the study period were wearing a helmet.

HSRC seeks applications for annual highway safety scholarship

HSRC is currently seeking applications for the Megan Cornog Memorial Highway Safety Scholarship from graduate students with an interest in the field of highway safety. The \$1,000 scholarship is open to full-time students who will be enrolled in a master's program in fall 2013 at any of the University of North Carolina campuses. In a 500-1,000 word essay, applicants

will be asked to explain how their field of study could be used to prevent motor vehicle-related deaths and injuries on North Carolina roads. Candidates will also be evaluated based on academic performance, extracurricular and professional activities, and work experience.

The purpose of this scholarship is to foster the education and professional development

of graduate students with an interest in transportation safety-related areas, including, but not limited to, engineering, driver behavior, planning, public health and environment. Please share this opportunity by directing potential applicants to the additional information available on the HSRC website. The deadline to submit an application is May 15, 2013.

Annual Report highlights Center achievements

Last month, HSRC announced the release of its FY2012 Annual Report. In the past year, in addition to its many other accomplishments, the Center celebrated a milestone in child passenger safety in North Carolina, organized a symposium to tackle the growing speed and safety problem on the state's roadways, expanded our professional development offerings, and continued to conduct evaluations of safety policies and interventions nationwide.

The following are a few brief highlights from the report. During the 2011-2012 year, HSRC:

- Released more than 35 publications and presentations on a variety of topics, from parental awareness of supervised driving requirements for beginning drivers to leveraging the health benefits of active transportation
- Generated more than \$16 in revenue for every \$1 of support provided by the state



ONLINE

Download a full PDF version of the 2012 Annual Report at bit.ly/HSRC2012.

- Awarded HSRC's fifth annual scholarship to encourage more interest among graduate students in the field of highway safety
- Awarded 13 Walk Friendly Community designations, bringing the total number of communities recognized since the program's launch in April 2011 to 24 (as of June 20, 2012)
- Launched the first-ever National Bike to School Day in May 2012

It has been a busy and rewarding year at HSRC, and we hope you enjoy reading about our

efforts to improve safety on the state's and nation's roadways. A digital copy of the report is available on the HSRC website.

In addition, HSRC has recently produced several other new resources, including the Pedestrian and Bicycle Information Center (PBIC) Summary Report on Annual Activities; PBIC White Paper Series, which covers some of its most commonly requested topics from engineers, public health officials, planners and advocates; and the Walk Friendly Communities Guide Book created to help communities become more pedestrian friendly.

HSRC publications and presentations

HSRC IN THE NEWS

The following is a highlight of recent media articles that include information and research from HSRC.

Honk if you love apps that protect teen drivers
USA Today, April 5, 2013

Child passenger safety a must
The Blowing Rock, March 18, 2013

Fayetteville ranks high in auto crashes, driving up insurance rates for drivers
The Fayetteville Observer, March 10, 2013

Bill filed in NC House looks to relax motorcycle helmet laws
News 14 Carolina, March 5, 2013

A (Text) Message 2 Die 4? Educating Young Drivers
WUNC, Feb. 28, 2013

City says 'no' to medians
Carteret County News-Times, Feb. 13, 2013

Meet the Romney protégé who wants to be Massachusetts' next senator
ThinkProgress.org, Feb. 13, 2013

DPS raises awareness of jaywalking
The Daily Tar Heel, Feb. 3, 2013

Durham school zones: Cross at your own risk
The News & Observer, Oct. 21, 2012

'Plugged-in' teens vulnerable in traffic
WTVM, Oct. 19, 2012

Speeders, beware: Cameras on rise
Cincinnati.com, Oct. 22, 2012

Planning is key to easy holiday travel
The Fayetteville Observer, Nov. 20, 2012

Reading a print version? Find links at www.hsrc.unc.edu/news_room.

HSRC researchers and staff regularly publish findings in peer-reviewed journals and present research results at professional meetings and trade conferences in the fields of transportation, safety, research, and public health. The following includes some of HSRC's most recent publications and presentations. Many of these presentations are from the 92nd Annual Meeting of the Transportation Research Board in Washington, D.C. to which several HSRC staff traveled in January.

- Foss, R., Martell, C. (2013). Did graduated driver licensing increase the number of newly licensed 18-year-old drivers in North Carolina? Presentation to the 92nd Annual Meeting of the Transportation Research Board.
- Hauer, E, Bonneson, J.A., Council, F.M., Srinivasan, R., Zegeer, C. (2012). Crash modification factors: Foundational issues. *Transportation Research Record*, 2279, 67-74.
- Lan, B., Srinivasan, R. (2013). Safety evaluation of discontinuing late night flash operations at signalized intersections. Presentation to the 92nd Annual Meeting of the Transportation Research Board.
- Nicholas, D. (2012). Walk this way: From coast to coast, SROs utilize program to improve safety of students who walk or bike to school. *The Journal of School Safety*, Winter 2012, 30-33.
- Persaud, B., Gross, F., Srinivasan, R. (2012). Evaluation of two treatments for reducing crashes related to traffic signal change intervals. *Transportation Research Record*, 2298, 38-45.
- Poole, B. (2012). An Overview of Automated Enforcement Systems and Their Potential for Improving Pedestrian and Bicyclist Safety. Pedestrian and Bicycle Information Center White Paper Series.
- Sandt, L., Foss, R. (2013). Teen driver trip characteristics before and after graduated driver licensing. Presentation to the 92nd Annual Meeting of the Transportation Research Board.
- Srinivasan, R. (2012). Safety evaluation of two treatments at signalized intersections in North Carolina. Presentation to the 38th International Forum on Traffic Records & Highway Information Systems, October 28-31, 2012, Biloxi, Mississippi.
- Srinivasan, R., Carter, D., Smith, S., Lan, B. (2013). Safety evaluation of converting traffic signals from incandescent to LED bulbs. Presentation to the 92nd Annual Meeting of the Transportation Research Board.
- Srinivasan, R., Lyon, C., Persaud, B., Baek, J., Gross, F., Smith, S., Sundstrom, C. (2012) Crash modification factors for changing left turn phasing. *Transportation Research Record*, 2279, 108-117.
- Wagner, L. (2012). Using health impact assessments to evaluate bicycle and pedestrian plans. Pedestrian and Bicycle Information Center White Paper Series.
- To learn more about current and past research publications of HSRC, browse www.hsrc.unc.edu/research_library.



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