

Brief 3

Using Research to Drive Public Policy: The Case of the North Carolina Graduated Driver Licensing System

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In 1997 North Carolina was one of the first two states in the nation to adopt a Graduated Driver Licensing system (GDL) to reduce motor vehicle crashes among young novice drivers. This policy was driven heavily by scientific research. At that time, motor vehicle crashes were the leading cause of death among teenagers. The adoption of GDL led to a sharp decline in teenage driver crashes and a decline in the motor vehicle death rate among teenagers.

The adoption of GDL is an example of how the North Carolina General Assembly used the best available scientific evidence to enact policies

that have proved helpful in addressing a serious threat to teenagers and those with whom they share the roads. Careful research conducted in North Carolina since 1997 has helped establish the GDL system as an evidence-based program. As a result, 46 other states have adopted GDL. The system is unique in the history of traffic safety in its ability to reduce crashes among the youngest drivers. Studies of the best GDL systems report crash rate declines of nearly 40 percent among 16-year-olds and 20 percent among 17-year-olds.¹ This brief describes how GDL was adopted in North Carolina and offers it as a model of how research can inform future policymaking.

This brief was prepared in conjunction with a presentation delivered by Robert Foss at the 2009 North Carolina Family Impact Seminar, “Evidence-based Policy: Strategies for Improving Outcomes and Accountability.” Robert Foss, PhD, is a Senior Research Scientist and Director of the Center for the Study of Young Drivers, Highway Safety Research Center, University of North Carolina – Chapel Hill.

This brief draws heavily from earlier published research, in particular:

Foss, R. D., Feaganes, J. R., & Rodgman, E. A. (2001). Initial effect of graduated driver licensing on 16-year-old driver crashes in North Carolina. *Journal of the American Medical Association*, 286, 1588-1592.

Foss, R. D., & Goodwin, A. (2003). Enhancing the effectiveness of graduated driver licensing legislation. *Journal of Safety Research*, 34(1), 79-84.

Foss, R. D. (2007). Addressing behavioral elements in traffic safety: A recommended approach. In *Improving traffic safety culture in the US: The journey forward*. Washington DC: AAA Foundation for Traffic Safety.

How the Program Started

Crashes, injuries and deaths among teenage drivers were and continue to be serious problems. What we have learned from the GDL program can inform continued efforts to reduce crashes, injuries and deaths on North Carolina's roads. Motor vehicle crashes account for about 35 to 40 percent of deaths from all causes among teens 15 to 19 years of age in the United States. The teen driver problem is particularly acute among the youngest drivers. Among 16-year-old drivers, the crash rate per mile driven is about 1.5 times greater than for 17-year-olds, 2.7 times greater than for 18-year-olds, 3.9 times that of 19- and 20-year-old drivers, and nearly 10 times that of 30- to 59-year-old drivers.² Moreover, motor vehicle death rates per licensed driver among all drivers older than 17 years declined from 1976 to 1996, reflecting the effects of a variety of safety improvements. Yet the per driver death rate among 16-year-olds increased considerably, apparently indicating an inability of novice drivers to cope with an increasingly complex driving environment.³

The first steps toward a policy approach to dealing with a complex problem like motor vehicle crashes are to document the size of the problem and then, based on an understanding of its nature, to determine whether a policy might be expected to have a beneficial effect and be feasible to implement. The better a problem is understood, the more likely it is that we can determine where to intervene and what sorts of interventions might reasonably be expected to reduce the problem. The North Carolina Child Fatality Task Force, established by the North Carolina General Assembly and the North Carolina Governor's Highway Safety Program, worked to publicize the number of fatalities associated with teenage-driver automobile crashes. This helped put this issue on the public's agenda. The task force asked researchers at the University of North Carolina Highway Safety Research Center for guidance on how to reduce the teenage crash rate. Analysis of when, where and why teen drivers were involved in crashes was an invaluable first step toward finding potential solutions.

Analyses of crash data revealed patterns that suggested possible interventions. First, the crashes

were much more highly concentrated among the youngest and least experienced drivers, something that—surprisingly—was not previously understood. Teens were lumped together and seen as uniformly poor drivers. Analysis of crashes by single year of age revealed quite a different picture. Second, crash types suggested that lack of driving “savvy” or wisdom, rather than deliberately risky or foolish behavior (e.g., drinking, thrill-seeking), was the most common factor associated with crashes among these least experienced drivers. More specifically, crashes among novice drivers appeared to result from two things: (1) limited ability to accurately judge risk and opt for appropriate actions and (2) the impulsive behavior style that is characteristic of adolescents. Third, the most dangerous conditions for young novices involved nighttime driving, which is often “recreational” and involves multiple teenage passengers. The largest numbers of young driver nighttime crashes occur between 9 p.m. and midnight, not during the post-midnight hours typically thought of as high risk.

Once specific crash patterns were identified, researchers at the Highway Safety Research Center looked for evidence-based approaches that could address the identified phenomena (inexperience, impulsiveness and nighttime crashes). Researchers identified two independent evaluations of a graduated licensing program in New Zealand.^{4,5} This program reduced teen driver crashes and injuries by providing young beginning drivers with substantial practical driving experience under the safest possible conditions, moving drivers through various levels with limited driving privileges before full licensure. New Zealand's GDL was based on evidence that with a year or two of experience, most people learn to drive reasonably safely. GDL changed the driver licensing approach to make the initial year or two of driving—when most of the essential learning takes place—safer for inexperienced drivers by specifying the conditions for when and how they are allowed to drive, depending on their experience. In brief, GDL tries to ensure that teens have plenty of experience obtained under realistic but reasonably safe conditions prior to being allowed to drive by themselves.

A number of studies also showed that restricting nighttime driving for young drivers led to substantial reductions in crashes, injuries and fatalities during restricted hours.^{6,7} Given that the large majority of nighttime crashes among young drivers occur between 9 p.m. and midnight, a driving restriction during these early hours was needed to effectively reduce crashes among this age group. Restrictions beginning after 11 p.m. or midnight can address only a small fraction of the risk to the novice driver population. Although the risk *per trip* is much higher after midnight, the greatest safety gains come from starting the restrictions earlier, when most night driving among this age group occurs.

Other approaches that looked promising to some, such as improving the content of driver education classes, were not supported by research findings and did not appear to hold the promise of moving to a GDL system.

Based on this evidence, several groups, including the Child Fatality Task Force and the Governor’s Highway Safety Commission, recommended enactment of a GDL system for North Carolina. When legislation was first introduced, late in the 1994-1995 legislative session, there was some opposition, resulting from inadequate

understanding of what GDL involved and why. During the following 20 months a concerted effort was made to ensure that the public and legislators understood both the need for GDL and how its combination of elements were carefully designed to address what was known about the nature of young teen driver crashes. The GDL bill was passed and ratified in April 1997 and took effect on December 1, 1997.

Before the enactment of GDL in North Carolina, an individual with virtually no practical driving experience could obtain an unrestricted license. Persons 15 years or older who had passed a mandatory driver education class, a vision test, a sign recognition test and a written driving test could begin driving if supervised; persons 16 years or older could begin with no supervision and with no practice besides the few hours obtained during a driver education class.

The North Carolina GDL system changed the licensing process by creating two preliminary licensing levels preceding a full unrestricted license. Both of these levels involve constraints on driving to limit the risks faced by inexperienced drivers, with specific restrictions regarding nighttime driving. North Carolina’s

Levels of Licensing in the North Carolina GDL System (winter 2009)

Level	Requirements	Driving restrictions
Level 1	<ul style="list-style-type: none"> • At least 15 years old • Complete driver education • Pass written, sign recognition and vision tests 	Driving allowed only while supervised by a designated adult No mobile phone use while driving* All occupants must wear seatbelts
Level 2	<ul style="list-style-type: none"> • Complete 12 months at Level 1 • No traffic convictions in the final 6 months of Level 1 • Pass road test 	Unsupervised driving allowed 5 a.m. to 9 p.m.—driving at any other time must be supervised No more than one passenger younger than age 21** No mobile phone use while driving* All occupants must wear seatbelts
Level 3	<ul style="list-style-type: none"> • No traffic convictions in the final 6 months of Level 2 	No mobile phone use while driving* All occupants must wear seatbelts

* Added December, 2006.

** Added December, 2002.

GDL system required beginning drivers who are at least 15 years old and younger than 18 years to first hold a Level 1 license (learner permit) for a full year before graduating to the next level. Level 1 allows driving only while supervised by a designated adult—typically a parent or guardian. After completing the final six months of Level 1 with no traffic violations and passing a road test, a driver may move to Level 2 licensure. Level 2 allows unsupervised driving from 5 a.m. to 9 p.m. and supervised driving at any other time. After completing at least six continuous months at this level with no traffic violations, drivers can graduate to a full, unrestricted license. Under GDL new drivers also must be at least 15 years of age to begin the process, at least 16 to move to level 2, and at least 16½ to move to a full, unrestricted license. Progression through these stages is achievement-based rather than merely a function of age. Equally important, young beginning drivers are required to earn the privilege of an unrestricted license by demonstrating safe driving behaviors during the first 18 months of licensure.

Did the program work? Establishing Evidence to Support Continuation and Expansion of the Graduated Driver Licensing System

Although evidence from New Zealand showed strong support for a system of graduated licenses, North Carolina did not implement a system identical to New Zealand's. Nor is the North Carolina driving environment comparable to that of New Zealand. Some policymakers were concerned about the relevance of research and practice from other countries to policy development in North Carolina. Others questioned what parts of the system were most important, especially as other states began considering similar legislation. Given the need for sound North Carolina evidence to support the continuation of this program, researchers at the Highway Safety Research Center examined the effectiveness of the GDL system using the strongest possible quasi-experimental research design for this kind of policy.

Many factors besides a new policy may contribute to changes in the rate of automobile crashes. Some of these include the price of gas, economic conditions, changes in traffic enforcement policies,

improvements in roadway engineering and maintenance, safer motor vehicles, and so on. To obtain the best estimate of the impact of the GDL system, researchers needed a valid comparison, or control group, to increase confidence that changes in the rate of young driver crashes were due to the new licensing system and not (entirely) to other factors. Since it was not possible to randomly assign new drivers to different licensing systems, researchers used a different kind of control group, in this case crash rates among 25-to-54-year-old drivers in North Carolina. Although not a perfect match, most of the factors other than the new licensing system that would influence crashes among younger drivers would also affect adult drivers. The only group for which conditions changed was young drivers. Researchers looked at crash rates among both young drivers and 25-to-54-year-old drivers before and after the implementation of the new licensing system. A significant change in crashes among young drivers following enactment of GDL, with no parallel change among adult drivers, would be good evidence that the change was a result of implementing GDL.

Analysis

Highway Safety Research Center researchers obtained data on crashes for all drivers of passenger vehicles (i.e., passenger cars, station wagons, vans, light pickup trucks, and sport utility vehicles) from the North Carolina Crash Data File. This file contains information on all reportable motor vehicle crashes (those involving a fatality, personal injury, or property damage valued at \$1000 or more).

The analysis focused first on all crashes, then on subcategories based on severity (fatal, serious injury, or minor or no injury), time (day versus night), type (single versus multiple vehicle), alcohol involvement, and driving environment (more versus less urban counties). Crash severity was classified based on police officer reports of injury to occupants. In North Carolina, injuries are coded as fatal, incapacitating injury, visible minor injury, possible injury (complaint of pain with no visible injury), or no injury (property damage only). To compute rates, mid-year population estimates for North Carolina were obtained from

the US Census Bureau Web site. Driver license information was extracted from the North Carolina Driver History File.

The researchers compared 16-year-old driver crash data for December 1, 1998, through November 30, 1999 (hereafter referred to as 1999) with those from 1996 and 1997. Crash rates based on age-specific populations were computed to adjust for population growth from 1996 to 1999. To control for general crash trends that might reflect economic factors, special traffic safety initiatives or varying levels of enforcement, changes in 16-year-old driver crash rates were compared with those for drivers 25 to 54 years of age.

Results

The results were impressive. Across the state, crash rates declined sharply for all levels of severity among 16-year-old drivers after the GDL program was implemented. Comparing 1996 with 1999, fatal crashes declined 57 percent, and crashes with no or minor injuries decreased 23 percent. The benefit of the nighttime driving restriction, which lasts only six months for most young drivers, was similarly impressive. Compared with 1996, 16-year-old-driver crashes between 9 p.m. and 5 a.m. in 1999 were 43 percent less likely, whereas daytime crashes declined by 20 percent. Single-vehicle crashes declined somewhat more than multiple-vehicle crashes, reflecting the fact that inexperienced drivers are particularly prone to single-vehicle crashes (which almost always result solely from the driver's own actions and not those of others on the road).

When compared to the adult drivers the results are even more impressive. Among this older age group, the crash rate actually increased by almost 6 percent from 1996 to 1999. With the exception of alcohol-related crashes, population-adjusted rates for the older age group increased in every crash subgroup as well. This clearly indicates that the decreases among 16-year-old drivers did not result from a general downward trend in crashes. Adjusting for the overall crash trend, the crash rate among 16-year-olds decreased an impressive 27 percent from 1996 to 1999. Similar findings were obtained by researchers in Michigan, another early

adopter of a GDL program. Subsequent research in several other states has found similar beneficial effects of enacting a GDL system.⁸ A more recent study examining the long-term effect of the North Carolina GDL system has documented a 38 percent decrease in crashes among 16-year-olds and a 20 percent decline among 17-year-olds, both of which are nearly identical to findings for the Georgia GDL program.

This is the great advantage of policy approaches based on a scientifically sound understanding of a problem: where policy approaches are sustainable, there are certain and enduring results.

There has been a substantial amount of follow-up research on GDL looking at additional crash data, hospital admissions and associated costs as well as self-report surveys of parents and teens. Analysis of medical records showed that hospitalizations of 16-year-old drivers declined by 36.5 percent and that hospital charges for their care dropped by 31.2 percent, or \$650,000 per year.^{9,10} This research strongly underscores the effectiveness of GDL as well as widespread endorsement of the approach by parents and teens alike. Research in other states finds similar results. However, states with weaker GDL systems (e.g., shorter learner periods, inadequate night and passenger restrictions) obtain smaller crash reductions.

Most impressively, the effect of GDL has persisted over time. Because it is a policy approach that instills a permanent change in how an important process operates—the role of the licensing system in developing savvy drivers—the effects do not require a continual devotion of extra resources for education or enforcement efforts to be sustained. This is the great advantage of policy approaches based on a scientifically sound understanding of a problem: where policy approaches are sustainable, there are certain and enduring results. We believe that the success of the GDL effort in North Carolina has helped with subsequent efforts to improve highway safety. The same approach, using data and evidence to drive public policy, helped persuade the legislature to enhance the GDL system by adding a restriction on the number of youth allowed to ride with inexperienced drivers

(in 2002) and restrictions on the use of cell phones by young drivers (in 2006). In each case, initiatives were based on the analysis of crash data and scientific understanding of driver behavior. In both instances the effects of the policy changes have been studied carefully to provide the evidence needed to spread these policies to other states. It is

not often that we can clearly demonstrate how the use of scientific evidence to inform policy can save so many lives. Our goal is for this kind of evidence-based policy to continue to be at the center of traffic injury prevention efforts and, through publications like this one, spread to other fields.

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² Williams, A. F. (2003). Teenage drivers: Patterns of risk. *Journal of Safety Research*, 34, 5-15.

³ Insurance Institute for Highway Safety (1998). Youngest drivers at risk. *Status Report*. 33(6), 1-2.

⁴ Frith, W. J., & Perkins, W. A. (1992). The New Zealand graduated driver licensing system: National Road Safety Seminar, Wellington, New Zealand. *Seminar Papers*, 2, 256-278.

⁵ Langley, J. D., Wagenaar, A. C., & Begg, D. J. (1996). An evaluation of the New Zealand graduated driver licensing system. *Accident Analysis and Prevention*, 28, 139-146.

⁶ Williams, A. F., Lund, A. K., & Preusser, D. F. (1985). Night driving curfews in New York and Louisiana: Results of a questionnaire survey. *Accident Analysis and Prevention*, 17(6), 461-466.

⁷ Preusser, D. F., Williams, A. F., Lund, A. K., Zador, P. L. (1990). City curfew ordinances and teenage motor vehicle injury. *Accident Analysis and Prevention*, 22(4), 391-397.

⁸ Shope, J. T. (2007). Graduated driver licensing: Review of evaluation results since 2002. *Journal of Safety Research*, 38(2), 165-175.

⁹ Margolis, L. H., Masten, S. V., & Foss, R. D. (2007). The effects of graduated driver licensing on hospitalization rates and charges for 16- and 17-year-olds in North Carolina. *Traffic Injury Prevention*, 8(1), 35-38.

¹⁰ Foss, R. D. (2007). Improving graduated driver licensing systems: A conceptual approach and its implications. *Journal of Safety Research*, 38, 185-192.