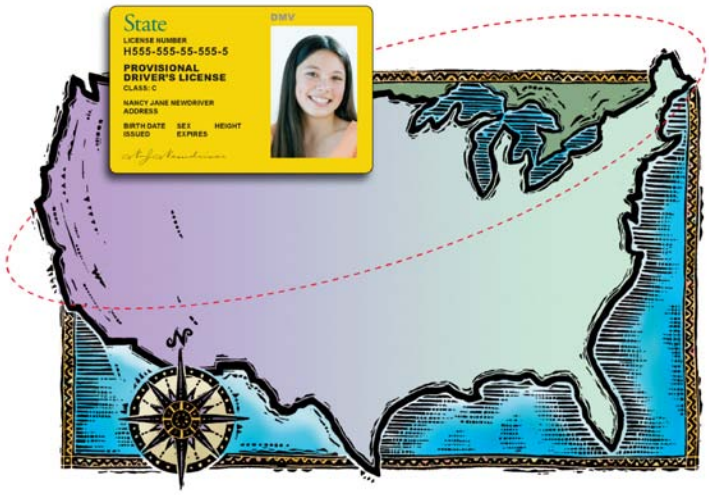
Nationwide Review of Graduated Driver Licensing



Summary Report

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Introduction

Motor vehicle crashes are the number one cause of death among teenagers in the United States, with roughly 1,000 16-year-old drivers involved in fatal crashes annually. Many diverse approaches, from minimum drinking age laws to driver education, have attempted to reduce the toll of motor vehicle crashes involving new drivers.

One highly promising approach is Graduated Driver Licensing (GDL), which is intended to ease new drivers onto the road in a step-by-step process in which their driving privileges are initially limited and then phased in gradually as the driver gains experience. A typical three-stage GDL program comprises a "learner" stage, during which all driving must be supervised; followed by an "intermediate" (or "provisional") stage, during which unsupervised driving is permitted except under certain conditions (e.g., at night or with passengers); and finally full, unrestricted licensure.

In 1996, Florida became the first state in the U.S. to implement a three-stage GDL system. Today a total of 44 states have enacted three-stage GDL systems, and all states have some form of GDL. Virtually all studies of GDL programs, at the state or national level, have found GDL to be effective in reducing the crash involvement of young drivers. However, due to both the wide range of types of GDL programs that exist, and differences in the methods used in different studies, it is extremely difficult to determine what types of GDL programs are most effective.

This study addresses this research need by analyzing the impact of GDL programs implemented in the United States between 1994 and 2004 on the involvement of 16-year-old drivers in fatal crashes and injury crashes, and identifies characteristics common to effective programs.

Methodology

This study is based upon analysis of data on fatal crashes, compiled and made available to the public by the National Highway Traffic Safety Administration; midyear population estimates, compiled and made available to the public by the U.S. Census Bureau; data on injury crashes, compiled by individual states and obtained specifically for this study with the permission of each respective state; and information on GDL laws, provided by the Insurance Institute for Highway Safety, AAA, and representatives of individual states.

Negative binomial regression models were fitted using generalized estimating equations to estimate the impact of GDL on the crash involvement rates of 16-year-old drivers over the period of the study, while controlling for factors unrelated to GDL that influenced crash rates across states (e.g., demographics or level of urbanization), over time (e.g., trends across all states included in the study), and seasonal variation (e.g., weather or travel patterns). In these models, crash rates per unit population, in each state, for each quarter-year of the study period (hereafter "state-quarter"), were analyzed for 16-year-old drivers. Drivers aged 20-24, 25-29, and 30-54 were also analyzed for comparison purposes, under the assumption that their crash rates would not have been impacted by GDL.

First, statistical modeling assessed the overall impact of having any form of three-stage GDL program in effect, relative to not having a three-stage GDL program. In this model, a binary variable indicated the presence or absence of any program that included a learner stage and an intermediate stage prior to full licensure.

Second, a similar model analyzed the impact of GDL programs having a given number of the components defined as follows. In this model, an ordinal variable indicated the number of components in effect, with the reference being state-quarters with none of the seven components. The maximum number of components actually in effect in any state-quarter included in the analysis was five.

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- ✔ A minimum age of **at least 16 years** for gaining a learner's permit.
- ✔ A requirement to hold the learner's permit for **at least 6 months** before gaining a license that allows any unsupervised driving.
- ✔ A requirement for certification of **at least 30 hours** of supervised driving practice during the learner stage.
- ✔ An intermediate stage of licensing with a minimum entry age of **at least 16 years and 6 months.**
- ✔ A nighttime driving restriction for intermediate license holders, beginning **no later than 10 PM.**
- ✔ A passenger restriction for intermediate license holders, allowing **no more than one passenger** (family members excepted).
- ✔ A **minimum age of 17 years** for full, unrestricted licensure.

Because overall results could be biased by short-term perturbations in crash rates associated with the implementation of new licensing policy (e.g., young people rushing to become licensed shortly before new restrictions take effect), four state-quarters before the effective date of each change in GDL legislation were excluded from the analysis. Four state-quarters were also excluded after the effective date of each change in legislation, because it can take as long as one full year from the time when legislation becomes effective until all 16-year-old drivers in the state are bound by the new legislation. Analyses of fatal crashes were based on data from 43 states from 1994 through 2004 (1,480 state-quarters; 8,953 16-year-old drivers in fatal crashes; excluded states: AK, DC, HI, ME, NH, RI, UT, and VA). Analyses of injury crashes were based on data from 35 states from which usable data were obtained, spanning 1994 through 2003, though not all years of data were available for all states (850 state-quarters; 489,836 16-year-old drivers involved in injury crashes; excluded states were the above states excluded from analyses of fatal crashes plus CT, IN, MS, NC, NJ, NY, OK, and WA).

Results

The per capita involvement rate of 16-year-old drivers in fatal crashes, adjusted for state-, year-, and quarter-fixed effects, was 11% lower in state-quarters with three-stage GDL programs than in state-quarters without three-stage GDL programs, and the corresponding rate of injury crash involvement was 19% lower in state-quarters with three-stage GDL programs. These differences were both statistically significant at the 95% confidence level. Rates of involvement in both fatal crashes and injury crashes were somewhat lower for comparison drivers aged 20-24, 25-29, and 30-54 in states with three-stage GDL programs than in states without three-stage GDL programs; however, none of these apparent reductions was statistically significant. These results are shown in Figure 1.

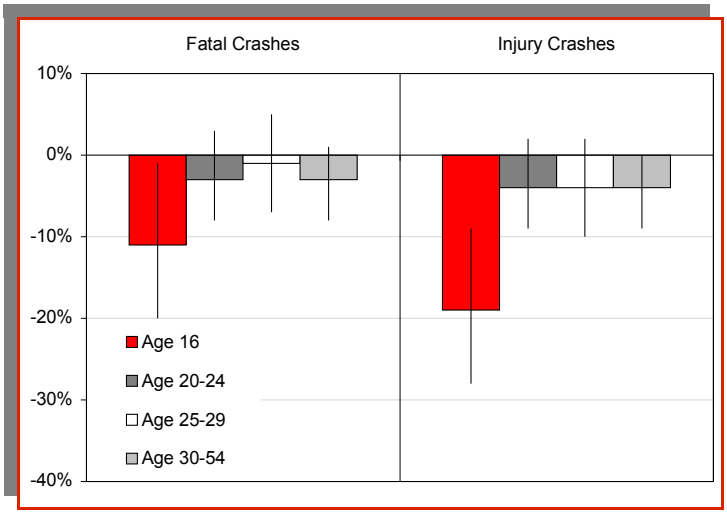

Figure 1. Percentage difference in fatal crash involvement rates and injury crash involvement rates in relation to driver age and presence of a three-stage GDL program. Vertical lines represent 95% confidence intervals.

In analyses of programs by their number of components, as defined above, the fatal crash involvement rate of 16-year-old drivers was 38% lower in state-quarters with five of the seven components in effect, and 21% lower in state-quarters with four components, relative to the rates in state-quarters in which none of the seven components was in effect. For injury crashes, the involvement rates of 16-year-old drivers were 40% lower in state-quarters with five components, and 36% lower in state-quarters with four components, relative to the rates in state-quarters with none of the components. All of these differences were statistically significant at the 95% confidence level. Differences in crash rates were smaller in all cases, and were not statistically significant in most cases, for the older comparison drivers. For 16-year-olds in programs with fewer than four of the seven program components, reductions were smaller, and were not statistically significant in the case of fatal crashes. These results are summarized in Figures 2 and 3.

Discussion

This is the first study to present national data pertaining to the impact of GDL programs on the injury crash involvement rates of 16-year-old drivers, in addition to fatal crash involvement. The results indicate that implementation of three-stage GDL programs was associated with an overall national reduction in the fatal crash involvement and injury crash involvement of 16-year-old drivers. The more comprehensive programs, quantified in this study according to the number of components that they include, are clearly more effective. Overall, programs with five of the seven components analyzed here

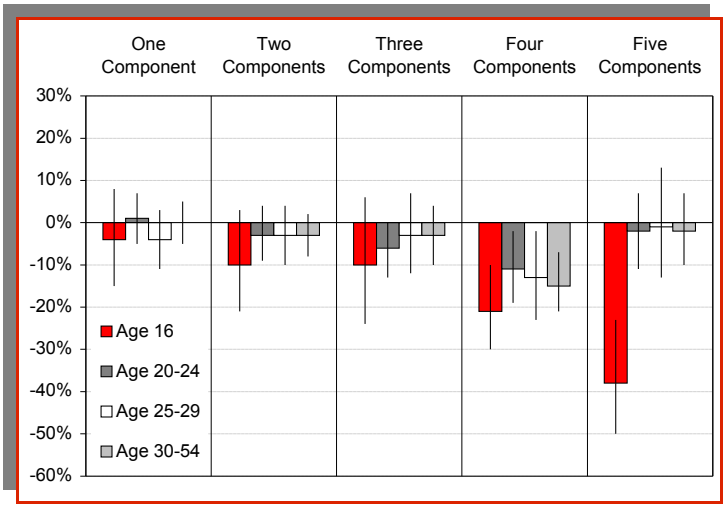

Figure 2: Percentage difference in fatal crash involvement rates in relation to driver age and number of GDL program components. Vertical lines represent 95% confidence intervals.

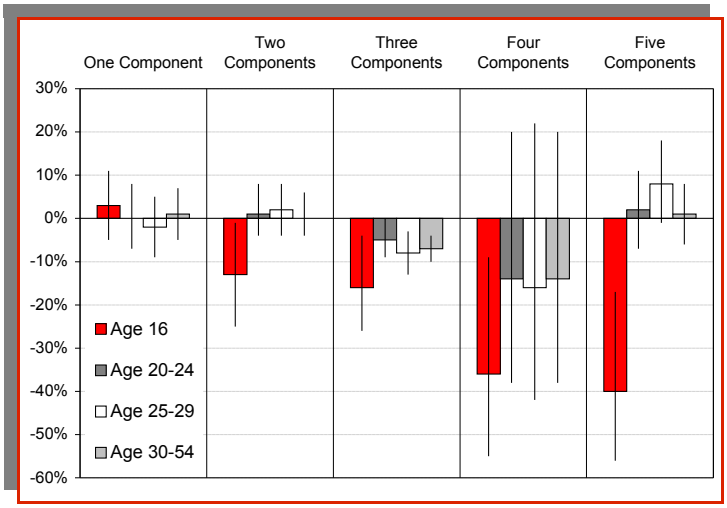

Figure 3: Percentage difference in injury crash involvement rates in relation to driver age and number of GDL program components. Vertical lines represent 95% confidence intervals.

were associated with reductions of 38% and 40%, respectively, in the fatal crash involvement rates and injury crash involvement rates of 16-year-old drivers. For all three-stage programs combined, including weaker programs, there were overall reductions of 11% and 19% in the fatal crash involvement rates and injury crash involvement rates of 16-year-old drivers, respectively.

Although most of the differences between the observed crash reductions associated with having *n* program components versus having *n – 1* components (e.g., five components versus four) were not statistically significant, it appears from Figures 2 and 3 that the crash involvement rates of 16-year-olds were generally lower in state-quarters in which more program components were in effect than in state-quarters in which fewer program components were in effect. Thus, these results suggest there is a "dose-response" relationship between the number of components in a program and its impact on the crash involvement of 16-year-old drivers.

It is extremely difficult to evaluate the effect of GDL legislation, because of the variety of state laws and the inherent difficulty of isolating the effect of GDL legislation from other factors. First, there is much variety in the implementation of some restrictions. For example, some states have nighttime driving restrictions that begin at 8 or 9 PM, whereas others do not begin until midnight or 1 AM. Second, often several GDL program components are implemented simultaneously (e.g., a nighttime driving restriction plus a passenger restriction). Together, these challenges make it virtually impossible to isolate the effectiveness of each individual component (e.g., having vs. not having a nighttime driving restriction), or to differentiate among variations of a single component (e.g., a nighttime driving restriction beginning at 8 PM vs. 10 PM). To facilitate statistical modeling, all GDL program components were dichotomized (i.e., classified as present or absent) according to the definitions provided previously. These definitions were selected by balancing existing recommendations, from IIHS, AAA, and others, with practical requirements to have a sufficient number of state-quarters to perform statistical analyses. The component definitions used here should not be construed as the optimal components for the best possible GDL programs.

The statistical modeling procedure used here took into consideration seasonal variations and time trends in crash rates across all states included in the study. However, the study was not able to account for changes in other laws, or other factors unrelated to GDL, that may have impacted some but not all states or may have impacted different states at different times over the course of the study (e.g., changes in speed limits or alcohol control laws). For example, Figure 2 shows that in state-quarters with four GDL program components in effect, the fatal crash involvement of the older comparison drivers was also significantly lower than in state-quarters without any GDL program components. It is possible that there were other factors besides GDL (not accounted for in the statistical model) that influenced crash rates in state-quarters with four GDL program components, leading to the result shown in Figure 2. This possibility should be investigated further in future studies.

It is also important to note that this analysis examined the crash rates of 16-year-old drivers per unit population. Thus, the observed crash reductions may have been attributable to reductions in licensing rates and/or delay in licensure among 16-year-olds, general reductions in the amount of driving done by the 16-year-olds who were licensed, specific reductions in the amount of driving done under high-risk conditions (e.g., at night and/or with passengers), driving more safely, or some combination of these. It also was not possible to distinguish the impact of having a law

per se from the impact of existing laws as they have actually been implemented. The current study was not able to examine the levels of public awareness of or compliance with the GDL legislation that was in effect. Factors such as these would likely influence the actual impact achieved in the real-world implementation of GDL legislation, and might reasonably be expected to vary across states and over time. Determination of the mechanisms responsible for the observed crash reductions was outside the scope of this study and should be studied further.

Finally, this report examines the impact of GDL on the per capita crash rates of 16-year-old drivers. The impact of GDL on the per capita fatal crash involvement rates of 17- and 18-year-old drivers will be addressed in a separate report by the same authors at a later date.

Despite the limitations of this study, these results, as well as a large and still growing body of research, indicate that GDL programs are effective in achieving real-world reductions in the toll of crashes involving 16-year-old drivers. The potential value of strengthening GDL programs is indicated by the apparent great difference between the *overall* nationwide reductions in crash rates associated with all three-stage GDL programs combined—including the weaker programs—and reductions associated with GDL programs that include five of the seven specified components.

Recommendations

- ✔ States that have not yet implemented three-stage GDL programs should do so.
- ✔ States should move toward implementation of a full complement of meaningful program components similar to those analyzed in this report.
- ✔ Future research should investigate the effectiveness of specific components of GDL programs (e.g., nighttime driving restrictions), including evaluation of different variations of similar components (e.g., the hours during which a nighttime driving restriction is in effect).
- ✔ Future research should investigate how other aspects of program implementation (e.g., publicity and enforcement) influence the effectiveness of programs.

For more information

To obtain a copy of the complete research report *Nationwide Review of Graduated Driver Licensing*, upon which this Summary Report was based, visit www.aaafoundation.org and click "Resources" to view or download a PDF version. To request a free hardcopy, please call, e-mail, or write to the AAA Foundation for Traffic Safety.

About the sponsors

The research reported in this Summary Report was funded by the AAA Foundation for Traffic Safety in Washington, D.C. Founded in 1947, the AAA Foundation is a not-for-profit, publicly supported charitable research and education organization dedicated to saving lives by preventing traffic crashes and reducing injuries when crashes occur. Funding for this report was provided by voluntary contributions from AAA/CAA and their affiliated motor clubs, from individual members, from AAA-affiliated insurance companies, as well as from other organizations and sources.

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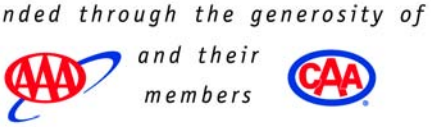

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