Does Graduated Driver Licensing Reduce Alcohol-Related Crashes?

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Keywords
Graduated driver licensing, young drivers, novice drivers, impaired driving, drinking driving, alcohol-related crashes

Abstract
Graduated driver licensing (GDL) has been implemented in numerous jurisdictions in North America and elsewhere to address the elevated crash risk of novice drivers, particularly young ones. Such a system phases in on-road driving, allowing beginners to gain their initial experience under conditions that are less risky. This paper examines the impact of GDL programs in Canada and the United States on alcohol-related crashes. Although every evaluation conducted to date has reported positive benefits overall, evidence for the effectiveness of GDL on alcohol-related crashes has been mixed. Reasons for this apparent inconsistency in the findings are discussed.

Introduction
The elevated crash risk among novice drivers, particularly young ones, has resulted in numerous jurisdictions in North America and elsewhere implementing graduated driver licensing (GDL). This system involves a step-wise introduction to full licensing that imposes restrictions on the new driver so they can gain their initial experience under conditions of low risk. Scientific evidence is mounting that GDL programs are an effective safety measure. Early efforts to implement versions of graduated licensing in Maryland and California were found to reduce the collision involvement of young drivers (1, 2). More recent evaluations of more comprehensive graduated licensing programs implemented in New Zealand in 1987, Ontario in 1994, Nova Scotia in 1994, Quebec in 1997, and Florida in 1996 have also found safety benefits, ranging from about 10% to 37% reductions on some measure of collision involvement (3, 4, 5, 6, 7).

Several evaluations are currently being conducted of graduated licensing programs implemented in Kentucky in 1996, Michigan in 1997, North Carolina in 1997, and California in 1998 (8, 9, 10, 11). Preliminary findings from these studies are consistent with the results of the completed evaluations.

Only a few studies have examined the effects of GDL specifically on alcohol-related crashes, even though an impact could be expected, given that many programs impose a night driving
curfew (the time most often associated with alcohol-related collisions) and some even impose a zero tolerance provision. However, evaluations that have examined the impact of GDL programs on alcohol-related crashes in Canada and the United States have produced mixed results. This paper describes these studies and discusses the apparent inconsistencies in their findings.

Method
Scientific papers published in journals, conference proceedings or technical reports on the safety effectiveness of GDL programs in Canada and the United States for drivers of passenger vehicles were identified and critically reviewed. Only four studies examined the impact of GDL programs on alcohol-related crashes. The author(s) and publication dates of each of these evaluations are shown in Table 1.

Table 1: GDL Evaluations

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>GDL Implementation Date</th>
<th>Author(s) and Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>1997</td>
<td>Shope et al. 2001</td>
</tr>
<tr>
<td>North Carolina</td>
<td>1997</td>
<td>Foss et al. 2001</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td>1994</td>
<td>Boase and Tasca 1998</td>
</tr>
<tr>
<td>Quebec</td>
<td>1997</td>
<td>Bouchard et al. 2000</td>
</tr>
</tbody>
</table>

All of these studies used pre-post comparisons with controls to assess changes in collisions among the primary target group. This approach involves comparing the prevalence of collisions among the primary target group prior to the introduction of the program to the collision experience of these groups after the program was implemented. Typically, the year the program was implemented is omitted from the comparisons because of transitional changes in licensing – e.g., a rush to get licensed just prior to implementation to avoid the new requirements (5).

The evaluations also compared per-capita collision rates in the before and after periods to control for fluctuations in population among the primary target group. A few studies compared per-driver collision rates to control for changes in licensing, which could account for changes in the frequency of collisions in the target group.

The two U.S. studies examined the impact of graduated driver licensing on the collisions of 16-year-old drivers, the primary target group for the program. The programs that have been evaluated in Canada examined the impact on all novice drivers, since the graduated licensing systems in Ontario and Quebec apply to all novices, not just those who are young.

The types of outcome measures of alcohol-related crashes examined in these studies have varied -- e.g., crashes in which police-reported the driver as having been drinking (HBD) or a “surrogate” measure such as single-vehicle crashes that occurred at night (SVN).

Results
All four studies consistently reported reductions in crashes of beginners, ranging from 17% in Quebec to 31% in Ontario. However, they did not all find a positive impact on alcohol-related
related crashes. A positive impact on alcohol-related crashes was reported in the evaluations of Ontario and Quebec programs; no effect was found in the evaluation of the Michigan or North Carolina programs. The relevant results are shown in Table 2 and discussed below.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Crashes Overall</th>
<th>Alcohol-Related Crashes</th>
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</thead>
<tbody>
<tr>
<td>The United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>-25%</td>
<td>NS</td>
</tr>
<tr>
<td>North Carolina</td>
<td>-23%</td>
<td>NS</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td>-31%</td>
<td>-27%</td>
</tr>
<tr>
<td>Quebec</td>
<td>-17%</td>
<td>-9%</td>
</tr>
</tbody>
</table>

**Michigan.** The GDL program was implemented in Michigan in 1997. Shope et al. (9) found that, after adjusting for population-wide trends, the overall per-capita collision rate of 16-year-old drivers declined significantly between 1996 and 1999 by 25%. There were also significant reductions over this period for non-fatal injury crashes (a 24% reduction) as well as for crashes occurring at night (a 53% reduction between midnight and 5 a.m.), during the evening (a 21% reduction between 9 p.m. and 12 a.m.), and during the day (a 24% reduction between 5 a.m. and 9 p.m.). Although the per-capita fatal crash rate also declined from 1996 to 1999, this difference was not statistically significant. Of primary concern to this paper, no significant decline was detected in the alcohol-related crash rate among 16 year olds, relative to those 25 years and older.

**North Carolina.** In a preliminary evaluation of the GDL program implemented in North Carolina in 1997, Foss et al. (10) reported that the per-capita crash rate of 16-year-old drivers declined by 23% (or by 27%, adjusting for the overall crash trend among drivers age 25-54). Per-capita crash rates declined for all levels of severity among 16-year-old drivers after the new program was implemented – fatal crashes by 57%, injury crashes by 28%, and non-injury crashes by 23%. Reductions were also observed for night-time crashes (by 43% between 9 p.m. and 5 a.m.) and daytime crashes (20%). As was the case in the Michigan analysis, the evaluation of the North Carolina program did not find a significant decline in the alcohol-related crash rate among 16 year olds.

**Ontario.** Boase and Tasca (4) conducted an interim evaluation of the Ontario program using a pre-post comparison group design. They found that the overall collision rate per 10,000 licensed novice drivers for 1995 (program group) was 31% lower than the rate observed for 1993 novice drivers (comparison group). The 1995 novice drivers had a casualty collision rate that was 24% lower than the rate of the 1993 novice drivers. They also reported that the 1995 G2 novice drivers (those in the intermediate phase) had an overall collision rate that was 16% lower than the rate for 1993 novice drivers.

The effects of the alcohol, night and freeway restrictions in Ontario were also examined and found to be very effective. Of pertinence to the present paper, reductions were observed in alcohol-related collisions (a 27% decline) as well as collisions between midnight and 5 a.m. (a 62% decline).
Quebec. The GDL program implemented in Quebec in 1997 has also been evaluated and proven effective (6). Bouchard et al. used a pre-post design to compare the crash record of the GDL group (learner and probationary drivers) with that of a non-GDL group composed of young drivers aged 18-24 who held a regular license. The authors found, after adjusting for changes in deaths and injuries among the control group, a 5% reduction in fatalities and a 14% reduction in injuries, attributable to the new program. To control for changes in the number of drivers, they compared per-driver collision rates of the GDL drivers and non-GDL drivers in the periods before and following graduated driver licensing. The per-driver fatality rate declined by 7% and the injury rate by 17%. Again, of particular relevance to the present paper, the analyses showed that alcohol-related fatalities and injuries – indexed in terms of the surrogate measure nighttime single vehicle crashes – declined by 9% among the GDL group, relative to the non-GDL group.

Discussion
Evidence of the effectiveness of GDL on alcohol-related crashes is mixed – a positive impact was found in Ontario and Quebec but not in Michigan and North Carolina. Several factors may explain this disparity.

First, unlike the GDL programs implemented in Canada, most of the GDL programs implemented in the United States do not include a zero BAC restriction because zero tolerance was already in place in these states for several years. Any impact of GDL on alcohol-related crashes in Michigan and North Carolina would have been expected when the zero tolerance law was introduced and not when GDL was implemented.

Second, U.S. GDL programs and studies also focus on the crash experience of teen drivers, typically those aged 16, who drive after drinking less often. Accordingly, alcohol-related crashes among 16 year-old drivers are relatively rare and it would, therefore, be difficult to detect a measurable impact. By contrast, GDL programs in Canada apply to all novice drivers, not just young ones, so it may be more likely to find a positive effect when the zero BAC restriction applies to all novice drivers. Moreover, no zero tolerance laws existed in Ontario or Quebec before the implementation of their GDL program with the zero BAC restriction.

Third, the positive findings in Ontario and Quebec may be overstated, or accounted for by factors other than the implementation of GDL. As mentioned previously, these studies used simple pre-post GDL comparisons with controls to assess changes in collisions among the primary target group. They did not consider the possibility that the reductions in alcohol-related crashes observed after GDL were, in part or totally, accounted for by a pre-existing downward trend in alcohol-related crashes. In this regard, Figure 1 compares trends in the percent of fatally injured 16-19 year old drivers in Canada who tested positive for alcohol with trends among a comparison group of 36-45 year olds. As can be seen, both groups are similar in that during the 1980s they showed a consistent decline in the proportion who were drinking, and showed less dramatic changes in the 1990s. But there are also differences in the trends. There was a much more dramatic decrease in the prevalence of drinking among young drivers who were killed – from 1982 to 1999, the percent of fatally injured drinking drivers aged 16-19 declined by 56%, compared to a 37% decline among fatally injured drinking drivers aged 36-45. A similar pattern occurred in the United States as shown in Figure 2, which compares trends in the percent of 16-20 and 35-44 drivers in fatal crashes who had been drinking. Thus, a pre-existing downward trend in alcohol-related teen crashes may account for at least some of the observed reductions after GDL was implemented.
Ontario and Quebec. The studies of the impact of GDL programs in Ontario and Quebec, as well as in North Carolina and Michigan, did not use time-series analysis, so the pre-existing downward trends in alcohol-related crashes would not have been fully taken into account. Further research is needed controlling for the pre-existing trends to determine the actual impact of GDL on alcohol-related crashes.

The above explanations suggest that GDL should only be expected to reduce alcohol-related crashes if the jurisdiction does not already have a zero BAC law and is now introducing one, or if the program targets older novices not just those aged 16 and 17. As well, studies should rule out the possibility that pre-existing trends account for, all or some of, the changes in alcohol-related crashes after GDL implementation. Given these issues, the specific impact of GDL on alcohol-related crashes is as yet unknown, and this needs to be pursued further.

Figure 1
Percent of 16-19 and 36-45 Year Old Fatally Injured Drivers with Positive BACs: Canada, 1982-1999

Figure 2
Percent of 16-20 and 35-44 Year Old Drivers in Fatal Crashes with Positive BACs: U.S., 1982-2000
References


