Fatal Crashes Involving 16 Year-Old Texas Drivers Pre- and Post-GDL: Who, When, Where, and Why?

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16. Abstract

The objective of this report was to document the circumstances surrounding fatal crashes in Texas that involved at least one 16 year-old driver during two-year periods before and after the adoption of a Graduated Driver Licensing (GDL) requirement on January 1, 2002.

The study found that, in most respects, the circumstances surrounding these extreme events (i.e., fatal crashes) were little changed in the post-GDL period as compared to the pre-GDL period. Whether the GDL requirement has had a more positive effect on less severe kinds of crashes involving 16-year-old drivers in Texas cannot be ascertained, because no non-fatal crash data are yet available for the period beginning January 1, 2002 or later.

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Introduction

The objective of this report is to document the circumstances surrounding fatal crashes in Texas that involved at least one 16 year-old driver during two-year periods before and after the adoption of a Graduated Driver Licensing (GDL) requirement on January 1, 2002.[1] This comparison will allow the following research questions to be addressed:

1) Did crash-related behaviors change post-GDL?
2) Do post-GDL behaviors suggest the need for changes in the Texas GDL requirement?

Because 16 year-olds with learner's permits were "grandfathered" in the old licensing system, the first 16 year-old drivers subject to GDL in Texas would have had to obtain their learner's permit on January 2, 2002. They could then obtain a provisional license on July 2, 2002 and begin driving independently, subject to passenger and late night driving restrictions for the next six months.

Given these facts, the pre-GDL period analyzed ran from July 1, 2000 through June 30, 2002. Because a mix of grandfathered and GDL-regulated 16 year-olds were likely licensed during the period July 1, 2002 to December 31, 2002, the post-GDL period for this research began on January 1, 2003 and ran through December 31, 2004. While some drivers licensed in 2003 might still come from the grandfathered group, it is assumed that their numbers are small, for they would have had to hold a learner's permit for more than one year. There were 219 drivers in the pre-GDL period and 156 drivers in the post-GDL period.

This report examines numerous factors associated with each driver's crash. These include: time of day, day of week, number and ages of passengers, roadway geometrics, road conditions (dry, wet, etc.), speed limit, alcohol and drug involvement, other driver factors, safety belt usage, first harmful event, most harmful event, and type of vehicle driven. All data used were obtained from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS).

Previous Research

Previous research makes it abundantly clear that 16 year-old drivers have highly elevated risks of crashing as compared to drivers of any other age (Williams, 2003; Mayhew et al., 2003), and that Graduated Driver Licensing reduces crashes by these drivers (Mayhew and Simpson, 2003; Rice et al., 2004; McKnight and Peck, 2002).

[1] A detailed description of the Texas Graduated Licensing Program may be found at http://www.txdps.state.tx.us/administration/driver_licensing_control/graduateddriver.htm

Exactly which components of GDL are most effective is not entirely clear, however (McKnight and Peck, 2002). Nevertheless, in summarizing research on this topic, Williams et al. (2005) concluded that late night driving and passenger restrictions have consistently been shown to have positive effects on all police-reported crashes. For example, Williams (2003) highlighted the riskiness of late-night (early a.m. hours) driving by 16 and 17 year-olds along with the risks imposed by the presence of passengers; especially three or more. Similarly, in research examining crashes by 16 and 17 year-old drivers in California, Rice et al. (2003) concluded that driving at night, driving without adult supervision, driving with any passengers, using alcohol, being 16, and being male were associated with high rates of crashes in which the driver was injured. They recommended GDL driving restrictions that begin at 10 p.m. and GDL restrictions on carrying passengers at any time.

Williams et al. (2005), which examined the characteristics of only fatal crashes involving 16 year-old driver nationally, pre- and post-GDL, was less definitive about the late night driving ban. Of the factors examined in this study (single vehicle crash, driver error, speeding, teenage passengers only, 0.08+ BAC, and timeframe of midnight – 5 a.m.), only crashes involving teenage passengers showed a significantly significant decline ($p < 0.001$), when comparing the year 1993 to 2003. Driver error was a factor in more than three-quarters of the crashes examined, both pre- and post-GDL. Similarly, speeding was a factor in 37% and 38% of fatal crashes in 1993 and 2003, respectively. Teen passenger involvement fell, however, from 53% to 44%. These findings are especially relevant to the research reported upon here, because it, too, looks only at fatal crashes involving 16 year-old drivers.

Findings

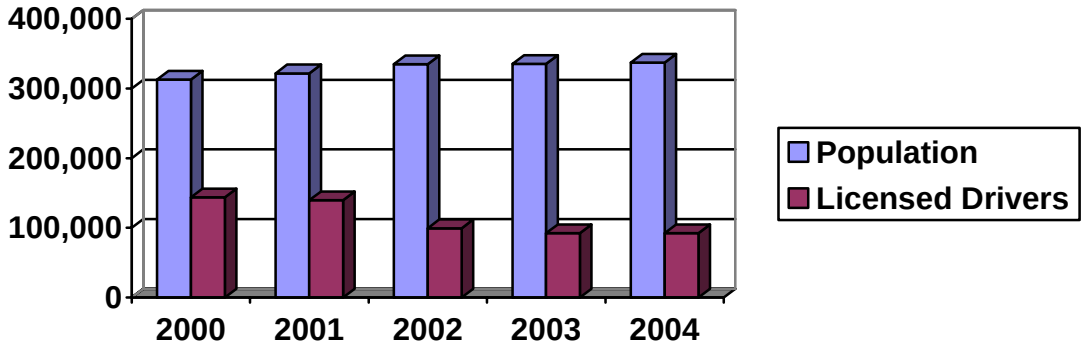
1. Licensed drivers and fatal crashes per licensed driver

Table 1 shows the population of 16-year-olds, 16-year-old licensed drivers, and fatal crashes involving a 16-year-old driver for the years 2000 – 2004. As can be seen from the table, and as illustrated in Figure 1, there has been a steady decline in the percentage of Texas 16-year-olds holding a driver's license – a trend that began even before the implementation of Graduated Driver Licensing on January 1, 2002. In 2000, 43.4% of 16-year-old Texans had a driver's license; by 2004 that percentage had fallen to only 27.4% – a 36.9% decline – while the absolute number of 16-year-old drivers fell 33.9%. However, the number of fatal crashes involving at least one 16-year-old driver fell only 22.3%. Indeed, on a per driver basis fatal crash involvement post-GDL, in 2003 and 2004, are slightly worse, on average, than they were in the two years pre-GDL (2000 and 2004) – 0.000789 pre-GDL versus 0.000845 post-GDL.

Table 1: Texas 16-Year-Olds

Year	TX 16-year-old population	TX 16-year-old licensed drivers	16-year-old drivers in fatal crashes in TX	Fatal crash involvement rate per licensed driver
2000	321,759	139,626	103	.000738
2001	332,752	120,302	101	.000840
2002	334,887	99,355	102	.001027
2003	335,374	92,309	76	.000823
2004	337,089	92,257	80	.000867

Figure 1: Texas 16-Year-Old Population and Drivers, 2000 - 2004



Source: U.S. Census Bureau, FHWA Table DL-22, FARS

2. Driving with teen passengers

When the drivers in this study drove with a passenger, it was overwhelmingly likely that their passenger was another "teen."[2] In the pre-GDL period, 104 (47.5%) of the fatal crash-involved 16 year old drivers in Texas carried no passengers at the time of their crash. The remaining 115 drivers had one or more passengers. In only twelve of the pre-GDL crashes were the only passengers adults. In only seven other crashes was there a mix of adult and juvenile passengers. Two crashes in the pre-GDL period involved only pre-teen

[2] Because the Texas GDL law regulates the number of passengers under age 21 that can be carried during the provisional license stage, "teen" or "teenage" is defined in this study as ages 13 – 20.

passengers. The remaining 94 crashes (81.7%) where a passenger was present involved one or more teenagers only.

The same pattern holds for the post-GDL period, and there is no statistically difference, at the .05 level of significance, in the number of solo drivers between the two periods. Sixty-two (39.7%) of the post-GDL drivers had no passenger. The remaining 94 drivers carried at least one passenger. During the post-period there were only nine crashes involving just an adult passenger and only seven involving a mix of adults and juveniles. Four involved a pre-teen as the only passenger(s). The remaining 74 crashes (78.7%) where a passenger was present involved one or more teenagers only.

Driving with teen passengers in the absence of adult supervision has been shown to increase crash risk (Rice et al., 2003). In particular, Chen et al., 2000 found a rising relative risk of driver death as the number of passengers increased in vehicles driven by 16 year-old drivers. Male teen drivers accompanied by male teen passenger(s) are especially risk-taking drivers (Simons-Morton et al., 2005).

In the present study, 48.0% of the pre-GDL drivers were carrying at least one "teenage" passenger in the absence of adult supervision. That figure fell only slightly to 46.1% during the post-GDL period.

The Texas GDL law prohibits carrying more than one teenage passenger during the six month provisional license stage immediately after licensure, and the percent of 16 year old drivers who were carrying two or more teenage passenger in the absence of adult supervision when they were involved in a fatal crash fell between the pre- and post-GDL periods – 27.0% and 19.9% respectively. This change was not statistically significant, however. Because we do not know the date of licensure for any of the drivers in this study, some could have been licensed more than six months when they crashed, and, thus, legally eligible to transport two or more passengers.

The percentage of drivers with just one passenger did rise in the post-GDL period, but not much, going from 21.0% pre-GDL to 24.3% post-GDL. Again, the change was not statistically significant.

Teen passengers of the 16-year-old drivers in this study were most likely to be of a similar age. During the pre-GDL period 122 of 180 (67.8%) of teen passengers were ages 15 – 17. The comparable figure for the post period was 95 of 136 (69.9%).

3. Two 16-year-old drivers

In the pre-GDL period, there were 4 crashes involving two 16-year-old drivers; in the post-period this figure jumped to 13, a statistically significant increase ($p \leq .05$)

in the proportion of crashes involving two 16-year-olds. In the pre-period, 5 of the 8 drivers had teen passengers; 3 carried no passengers. No adult passengers were involved. In the post-period, only 6 of 26 drivers had only teen passengers, a statistically significant reduction. Eleven of the 26 had no passengers, also a statistically significant increase. Five had only adult passengers. Two had pre-teen passengers only. The remainder carried a mix of passengers.

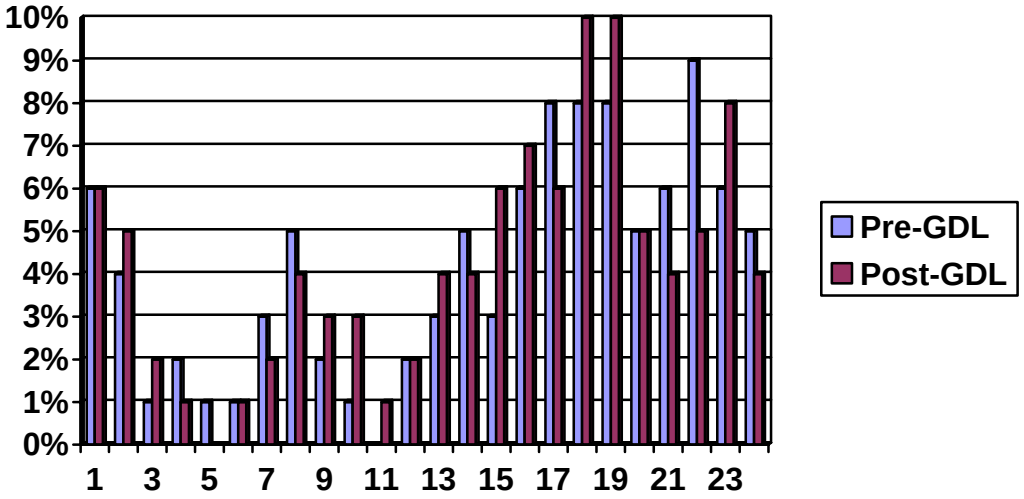
Based on the review of driver factors for these 34 drivers (pre- and post-) there is no apparent pattern as to either the likely cause of these crashes or the gender of the person who was assigned a driver factor as compared to the one who was not.

4. Time of day

During the pre-GDL period, 13.2% of the fatal crash-involved 16-year-old drivers crashed between the hours of midnight and 5:00 a.m. During the post-GDL period provisional license holders cannot legally drive during these hours, except under special circumstances. Despite this prohibition, 14.1% of the post-GDL 16-year-old drivers were involved in a fatal crash between midnight and 5:00 a.m. This increase was not statistically significant.

Looking at other periods during the day, two stand out has having high numbers of fatal crashes: 1) the 4-hour period from the end of the school day through dinner time (3:00 – 7:00 p.m.; i.e.,15:00 – 19:00) and 2) the 2-hour after dinner period from 9:00 p.m. until 11:00 p.m. (21:00 – 23:00). Thirty-three percent of the fatal crashes in the pre-GDL period occurred during the 4-hour time period; 39% during the post-GDL period. Fifteen percent of the fatal crashes in the pre-GDL period occurred during the first 2-hour time period; 13% during the post-GDL period. (None of these changes was statistically significant.) The most dangerous one hour periods during the pre- and post-GDL periods are illustrated in Figure 2. All except one (12:01 a.m. – 1:00 a.m.; i.e., 0:00 – 1:00) fall within this 9-hour period.

Figure 2: Crashes by Hour-of-Day



5. Day of Week

Pre-GDL Thursday, Friday and Saturday were the days of the week with the largest number of fatal crashes involving 16-year-old drivers in Texas, as illustrated in Figure 3. But these figures are misleading, because they are based on the 24-hour calendar day and, thus, obscure the heightened dangers present on Friday and Saturday nights after midnight. If crashes on Saturday morning between 12:01 a.m. and 5:00 a.m. are added to Friday's tally, and those on Thursday morning are similarly subtracted, 19% of the crashes occurred on "Friday" rather than 16%. Likewise, if the Saturday tally is adjusted this way, "Saturday" crashes rise from 20% to 17% of the total. The Thursday tally, similarly adjusted rises from 16% to 17%, and "Thursday" falls into a tie with Saturday as the second most dangerous day of the week. All of this is illustrated in Figure 4.

As illustrated in Figure 3, post-GDL, Thursday, Friday and Saturday continue to exhibit elevated crash risks – but so too does Sunday now. As was the case in the pre-GDL period, the raw numbers by day are misleading here, too, however. Adjusting the figures for crashes during the 12:01 – 5:00 a.m. time period, as was done above, raises the percent of "Friday" crashes from 19% to 22%, as do "Saturday" crashes. Meanwhile, Sunday falls back from 19% to 15% of the total. Thursday is unaffected by this adjustment. Thus, the adjusted Saturday and Friday periods are the most dangerous in the post-GDL period, as they were pre-GDL, but Sunday is now more dangerous than Thursday.

Figure 3: Crashes by Day of the Week

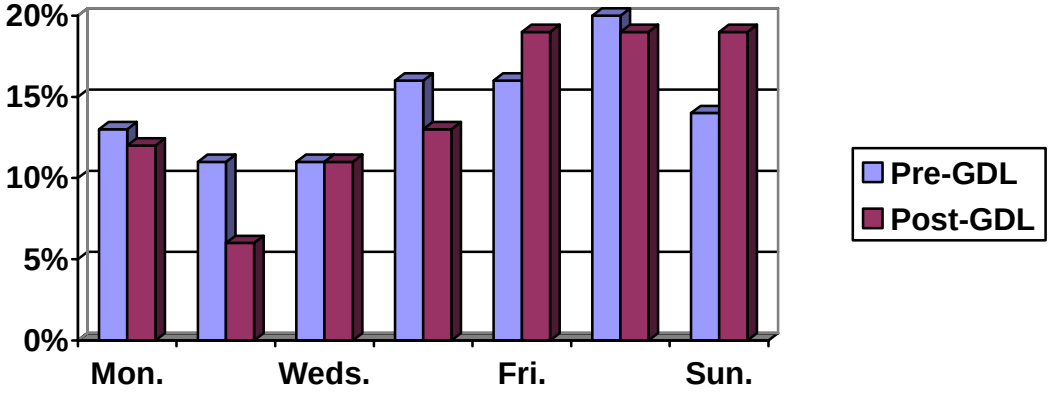
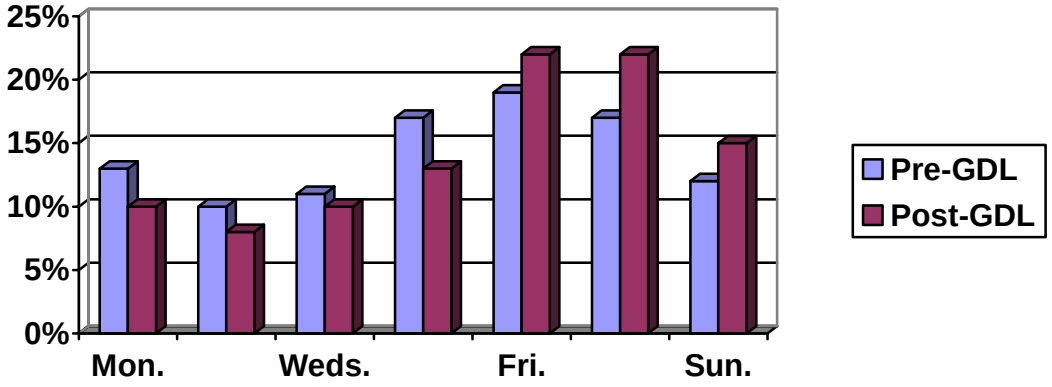


Figure 4: Crashes by Adjusted Day of the Week



6. Driver-Related Factors

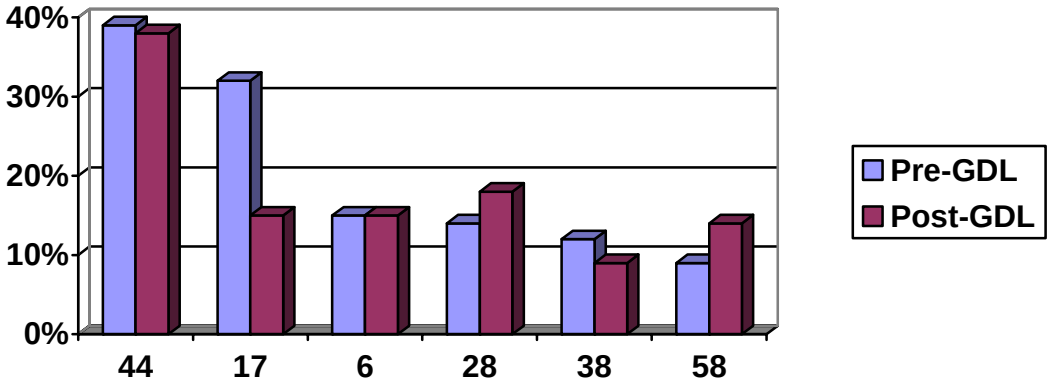
During the pre-GDL period the most frequently coded driver-related factor was 44 (Driving too Fast for Conditions or in Excess of Posted Maximum); 39.3% of the pre-GDL drivers had a code 44. In the post-GDL period 37.8% of the drivers had a code 44. There is no statistically significant difference between the two groups at the .05 level of significance.

The second most frequently cited driver-related factor in the pre-period was 17 (Running Off Road), with 71 of the 219 drivers receiving this code (32.4%). The comparable figures for the post-period were 24 of 156, or only 15.4%. The difference in proportions between the two groups is statistically significant at the .05 level.

The next three most frequently coded driver-related factors during the pre-period were 6 (Inattentive) (15.1% of drivers); 28 (Failure to Keep in Proper Lane) (14.2%); and 38 (Failure to Yield Right of Way) (11.9%). In the post-period, the top three other driver-related factors were 28 (17.9%); 6 (15.4%); and 58 (Over Correcting) (14.1%). None of the pre/post changes for this group of driver-related factors is statistically significant at the .05 level.

The relative importance of the five most frequently cited driver factors is illustrated in Figure 5.

Figure 5: Top Five Driver Factors



During the pre-period, 20.5% of drivers had no driver-related factors coded, while in the post-period 22.4% had zero factors. The difference is not statistically significant.

7. Gender

In the pre-GDL period, 64.4% of the fatal-crash-involved 16-year-old drivers in Texas were males; in the post-period 59.0% were male. Thus, 35.6% of pre-period drivers were female and as were 41.0% of post-period drivers. These changes are not statistically significant.

A few statistically significant gender differences are apparent. In the pre-period, females were significantly more likely, at the .05 level, to be coded 58 (Over Correcting) than were males. In the post-period males were significantly more likely to receive code 28 (Failure to Keep in Proper Lane) than were females. During the same period, females were significantly more likely to receive code 91 (Manslaughter, Vehicular Homicide). Also during the post period females were significantly more likely to receive code 17 (Running Off Road).

8. Driver likely at fault

FARS does not assign fault in crashes; instead it cites “factors” for the driver, vehicle, and the roadway. Assignment of fault in crashes is an often contentious issue; nevertheless, close examination of the Accident, Vehicle, Driver and Person files allows one to make a reasonable estimate of the at fault driver or drivers in most instances. In the pre-period, 168 (76.7%) of the 219 drivers appear to have made a misjudgment, had a lapse in attention, or deliberately misbehaved, thereby contributing to the circumstances that led to a fatal crash. The comparable figure for the post-period was 75.6% (118 of 156). The difference is not statistically significant.

In the pre-period, there was no significant difference in percentage of male and female driver deemed at fault. In the post period, however, female drivers were significantly more likely to be deemed at fault than male drivers.

9. Driver deaths and restraint use

In the pre-GDL period 46.6% of the 16 year-old-drivers died as a result the crash in which they were involved. In the post-period 39.7% of the drivers were killed. This difference is not statistically significant.

In the pre-period, 28.8% of the drivers involved in fatal crashes were unrestrained and 66.7% of these drivers were killed. In the post-period, 22.4% of the drivers were unrestrained and 65.7% were killed. Restrained drivers fared much better in both periods. In the pre-period, 68.9% of the drivers were restrained and only 37.1% of these drivers were killed. In the post period the comparable figures were 74.4% and 31.0%, respectively. See Figures 6 and 7. In both periods, unrestrained drivers were significantly more likely to be killed than were restrained drivers ($p \leq .05$).

Restraint use among all the 16-year-old drivers in this study (not just those killed) increased in the post-period, from 68.9% to 74.4%; however this change was not statistically significant.

Figure 6: Driver Deaths and Restraint Use Pre-GDL

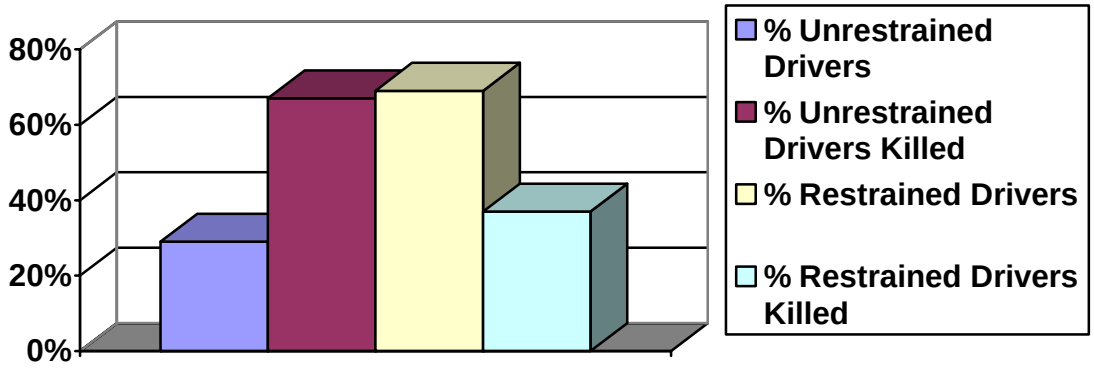
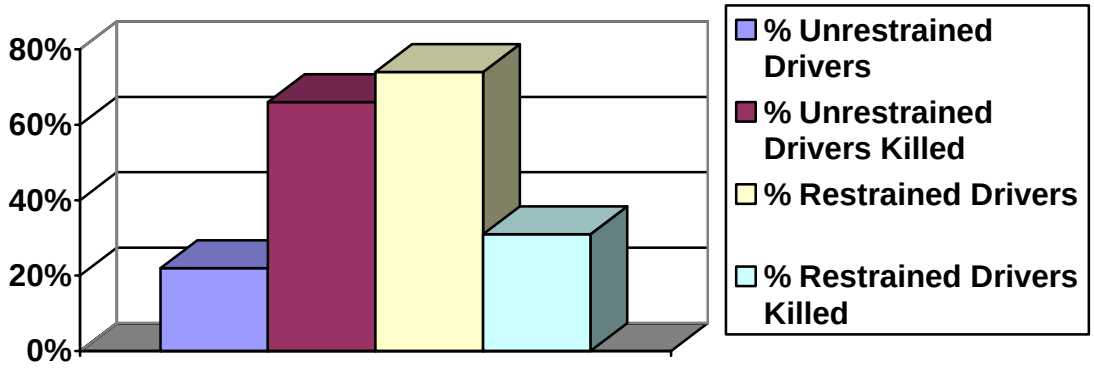


Figure 7: Driver Deaths and Restraint Use Post-GDL



10. Alcohol and drug involvement

Since September 1, 1999 it has been illegal for a Texas driver under the age of 21 to have any detectable level of alcohol use. In the pre-GDL period, only 12 of the 219 drivers (5.5%) had any detectable level of alcohol. In the post-period, the figure rose to 5.8%, not a statistically significant increase.[3]

In the pre-period, no illicit drug use was reported for any of the 219 drivers. In the post-period, drug use was reported for two of the 156 drivers – cannabis (along with alcohol) in one and several depressants in another.

11. Single vehicle versus multiple vehicle crashes

[3] It should be noted here that only about one-third of the drivers involved in fatal crashes in Texas are tested for alcohol use. Thus, it is reasonable to presume that these figures underestimate the actual level of alcohol use by the crash-involved drivers in this study.

In the pre-GDL period, 43.4% of the 16-year-old drivers involved in a fatal crash were in a single vehicle crash. The comparable figure for the post-period was 41.%. In the pre-period, the most common crash involved two vehicles, as was the case in the post period, at 48.1% and 46.1%, respectively. Crashes involving three or more vehicles accounted 10.5% of the pre-period crashes and 10.9% of the post-period crashes. None of these differences in proportions is statistically significant.

12. First harmful event

In both the pre- and post-GDL periods the most common first harmful event was code 12 (collision with another Motor Vehicle in Transport), at 52.6% and 49.3%, respectively. The second most common code in both periods was 1 (Overturn), at 13.5% and 16.9%, respectively. The third most common first harmful event in both periods was collision with a tree, at 7.3% and 6.4%, respectively. Once again, none of these differences is statistically significant.

13. Most harmful event

In both the pre- and the post-period, the most frequently coded code for "Most Harmful Event" was 12 (collision with another Motor Vehicle in Transport), being assigned in 49.8% of the pre-period driver cases studied and in 53.8% of the post-period cases. The second most frequently encountered code was 1 (Overturn), being found in 21.5% of the pre-period cases and in 23.1% of the post period cases. None of these differences is statistically significant.

14. Type of vehicle driven and driver death rates by vehicle

The most frequently encountered vehicle body type in both the pre- and the post-period is a 4-door sedan/hardtop (Vehicle Code 4), followed, in both periods, by a standard-size (full-size) pickup (Code 31), a 2-door sedan/hardtop/coupe (Code 2), a compact sport-utility vehicle (SUV) (Code 14) and, finally, a compact pickup (Code 30). Table 2 illustrates the prevalence of these five vehicle types in both periods, together with the driver death rates for each type of vehicle.

Table 2: Vehicle Prevalence and % of Drivers Killed

	% of Pre-Period Vehicles	% of Pre-Period Drivers of these Vehicles Who Were Killed	% of Post-Period Vehicles	% of Post-Period Drivers of these Vehicles Who Were Killed
4-Dr Sedan	33.3	52.1	27.6	55.8
Standard Pickup	18.7	43.9	18.6	24.1
2-Dr Sedan	13.7	56.7	17.9	46.4
Compact SUV	9.1	15.0	11.5	11.1
Compact Pickup	9.1	15.0	5.8	55.6

As Table 2 illustrates, drivers of sedans were more likely to be killed in both the pre- and post-periods than were drivers of standard-sized pickups and compact SUVs. In the pre-period, both compact SUV and compact pickup drivers were significantly less like to die than were drivers of 4-door sedans, 2-door sedans, or standard pickups ($p \leq .05$ for differences in proportions). In the post-period, compact SUV drivers were statistically significantly less likely to die than were drivers of both types of sedans, as well as drivers of compact pickups. In the post-period there was no statistically significant different death rate in compact SUVs as compared to standard pickups.

15. Roadway geometrics and conditions

In both the pre- and post-period, the fatal crashes occurred overwhelming under seeming benign operating conditions – straight, level, dry pavement with no traffic control devices involved. The road was straight where 86.8% of the pre-period drivers crashed and where 87.2% crashed in the post-period. It was level in 98.6% of the pre-cases and 99.4% of the post. It was dry in 86.8% of the pre-period cases and in 91.0% of the post-period cases. No traffic control device was involved in 75.8% of the pre-period cases and 75.0% of the post.

16. Speed limit

In the pre-GDL period, 48.8% of the drivers crashed on roads with a posted speed limit of less than 55 miles per hour. In the post-period the comparable percentage was 39.7. There is no statistically significant difference between the two proportions.

17. Road classification

In both the pre- and post-period the fewest number of drivers had their fatality-involved crashed on Interstate highways and other freeways or expressways. In

the pre-period, the study drivers had only 3.7% of their crashes on rural interstates and only 6.9% on urban Interstates or other freeways/expressways. In the post period the comparable figures were 4.5% and 10.3%. The differences are not statistically significant.

In pre-period, local roads and streets – both urban and rural – had the largest numbers of drivers involved in fatal crashes; 26.9% of the pre-period driver cases involved urban local streets and roads, along with16.9% on rural local streets and roads. In the post-period, the percentages were 17.3% and 15.4%, respectively. The difference in the proportions is significant ($p \leq .05$) for urban local streets and roads. This decline was offset by a statistically significant increase on rural major collectors, from 11.9% to 19.9%.

Overall, crashes on rural roads increased in the post period as compared to the pre-period. In the post-period, 60.3% of the drivers crashed on rural roads versus 54.5% in the pre-period. The difference is not statistically significant, however. The distribution of all drivers' crash locations by road type is illustrated in Table 3.

Table 3: % of Drivers' Crashing by Road Classification

	% of Pre-Period Drivers	% of Post-Period Drivers
Rural Interstate	3.7	4.5
Rural Principal Arterial	11.9	9.0
Rural Minor Arterial	7.8	8.3
Rural Major Collector	11.9	19.9
Rural Minor Collector	2.3	3.2
Rural Local Roads & Streets	16.9	15.4
Urban Interstate	4.6	7.1
Urban Freeway/Expressway	2.3	3.2
Urban Principal Arterial	9.1	9.0
Urban Minor Arterial	2.7	2.6
Urban Collector	0	.6
Urban Local Roads & Streets	26.9	17.3

18. County

There are 254 counties in Texas. In the pre-GDL period, the 219 drivers in this study crashed in 91 different counties. In the post-period, the 156 drivers crashed in 81 different counties. Reinforcing this apparent random distribution of

crashes is the fact that, while the most populous county in Texas, Harris (2000 population 3,400,578), had the most 16-year-old drivers involved in fatal crashes in the pre-period (17), it ranked second to much smaller Dallas (2000 population 2,218,899) in the post-period, with 9 drivers versus Dallas' 11. Also, McLennan County (the 20th most populous) had only 2 drivers in pre-period, but 6 in the post, while Travis (#5 in population) had 7 driver-cases in the pre-period but only 1 in the post.

Discussion

As was noted at the beginning of this paper, the objective of this research was to document the circumstances surrounding fatal crashes in Texas that involved at least one 16 year-old driver during two year periods before and after the adoption of a Graduated Driver Licensing (GDL) requirement on January 1, 2002. This comparison was made in order to address two questions:

1) Did crash-related behaviors change post-GDL?
2) Do post-GDL behaviors suggest the need for changes in the Texas GDL requirement?

For the most part, the analysis shows the circumstances surrounding these fatal crashes to be very similar in both the pre- and the post-GDL period. For example, 3:00 – 7:00 p.m. and 9:00 – 11:00 p.m. were the most danger hours of the day in both periods. Friday and Saturday were the most dangerous days. Speeding was the most commonly coded driver-related factor, by far. No driver-related factor was coded for only about 20% of the drivers in both periods. The 16-year-old drivers were deemed "at fault" in about three-quarters of all the crashes. More males than females were involved in crashes, in about the same proportions. Crashes involving a single vehicle, two vehicles, and three or more were in the same proportions in both periods. In both periods the most common first harmful event and most harmful event were collision with another vehicle. The second most common first harmful event and most harmful event were overturn. Proportionately, more drivers of sedans died in both periods than drivers of compact SUVs. Interstates and other high-standard roads had the fewest driver cases in both periods. Local roads and streets – both urban and rural – had the most.

That is not to say that there no noticeable differences between the pre- and the post-period; even some statistically significant ones. For example, there was a large (but not statistically significant) drop in the number of 16-year-old drivers who crashed while carrying two or more teenaged passengers, as would be expected with about half of 16-year-old drivers likely operating on provisional licenses that prohibit the carrying of more than one passenger. Crashes involving running off the road declined significantly in the post-period. Also, female drivers were significantly more likely to be deemed at fault than male drivers in the post-period; no such difference was apparent in the pre-period. As

one would hope with all the recent emphasis in the U.S. (and Texas) on increasing restraint use, restraint use in the post-period was 5.5% higher than in the pre-period, though this increase was not statistically significant. Crashes on urban local streets and roads declined significantly in the post-period, while crashes on rural major collectors increased significantly.

While crashes by time-of-day are quite similar in the pre- and post-periods, the data add emphasis to the recommendation made by Rice et al. (2003) that a provision license curfew of 10:00 p.m. rather than midnight makes sense. About 12% of the post-period drivers crashed between 10:00 p.m. and midnight, as were 11% during the pre-period. Would it really be such an imposition to prohibit drivers with a provisional license from driving during these hours during the first six months of driving?

The other peak crash hours, 3:00 – 7:00 p.m., are more problematical, because these are times of day teen drivers are most likely to on the road, driving home from school and to and from work or afternoon school-related events. Prohibiting driving during this period would clearly represent an unpopular choice of safety over mobility.

Crashes on "adjusted" Fridays and Saturdays were problems in both the pre- and post-periods, with more than 20% of all the drivers studied having a crash on one of these days during the post-period. Crashes between midnight and 5:00 a.m. are a particular concern on Friday and Saturday nights, and the problem has not improved post-GDL, even with the implementation of the midnight curfew for provisional license holders.

The continuing early morning crash problem adds emphasis to a point that needs to be made here. Fatal crashes are aberrant events. They are rare; almost randomly distributed geographically (see *18. County* above); and overwhelmingly involve improper behavior (deliberate or inadvertent) by the 16-year-old driver, with speeding being the overwhelmingly #1 bad behavior. Under these circumstances, it is unrealistic to expect limited interventions like Graduated Driver Licensing to dramatically reduce fatal crashes involving 16-year-olds – a conclusion in keeping with the findings in Williams et al. (2005). Indeed, the findings here almost perfectly mirror those in that study, expect that the drop in crashes involving teen passengers was not statistically significant in the analysis being reported here.

Finally, whether the GDL requirement had a more positive effect on less serious kinds of crashes in Texas is a topic of great interest. Unfortunately, there are no non-fatal Texas crash data available latter than December 31, 2001.

Conclusion

The objective of this research was to review the circumstances surrounding fatal crashes involving 16-year-old driver behavior in Texas before and after the enactment of a graduated driver licensing requirement, effective January 1, 2002. The study found that, in most respects, the circumstances surrounding these extreme events (i.e., fatal crashes) were little changed in the post-GDL period as compared to the pre-GDL period. Whether the GDL requirement has had a more positive effect on less severe kinds of crashes involving 16-year-old drivers in Texas cannot be ascertained, because no non-fatal crash data are yet available for the period beginning January 1, 2002 or later.

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