Impact of Georgia's Teenage and Adult Driver Responsibility Act

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Study objective: In 1997, the Georgia General Assembly enacted the Teenage and Adult Drivers Responsibility Act (TADRA), a comprehensive legislative package that attempted to reduce fatal crashes of teenaged drivers by introducing graduated driver's licensing, "zero tolerance" of underage impaired drivers, and automatic license revocation for speeding greater than 25 miles per hour over the posted limit and other dangerous driving behaviors. To determine whether TADRA reduced teen driving fatalities, we examine fatal crash rates involving various age groups before versus after the law was enacted.

Methods: Data from the Fatal Accident Reporting System were used to calculate annualized fatal crash rates of various age groups of drivers during an 11-year interval 5½ years before TADRA was enacted and 5½ years afterwards. To identify potential historical effects, Georgia's experience was compared to that of Alabama, South Carolina, and Tennessee, states that did not adopt equally comprehensive legislation during the study period.

Results: During the preenactment period, 317 Georgia drivers aged 16 were involved in a fatal crash (57/100,000 person-years) compared to 230 in the postenactment period (36/100,000 person-years; risk ratio [RR] 0.63; 95% confidence interval 0.53 to 0.75). Speed-related fatal crashes were cut by 42%, and alcohol-related fatal crashes decreased nearly 60%, without displacing fatal crashes to older age groups. These reductions greatly exceeded those noted in 2 of 3 comparison states and the nation overall.

Conclusion: TADRA markedly reduced fatal crash rates among 16-year-old Georgia drivers. Fatal crashes were not displaced to older age groups. [Ann Emerg Med. 2006;47:361-369.]

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INTRODUCTION

Background and Importance

Motor vehicle crashes are the leading cause of fatal injury in the United States. Young drivers experience fatal crashes at substantially higher rates than older drivers,[1–4] which is largely attributed to driver inexperience and the tendency of many adolescents to take risks.[4–10]

To reduce fatal crashes involving teenage drivers, 41 states and the District of Columbia have adopted graduated driver's licensing systems. Most include a supervised learner's period, subsequent issuance of a provisional license for a specified period, and then full-privilege licensing.[11–16] Graduated driver's licensing systems vary widely by the strictness of their provisions. Published evaluations have found equally varying levels of effect.[17–22]

Responding to public outcry about fatal crashes involving teen drivers, Georgia's General Assembly implemented a tough approach to graduated driver's licensing in July 1997.[23–25] Titled the Teenage and Adult Driver Responsibility Act, or TADRA, it targeted 3 major contributors to fatal crashes by teenaged motorists: inexperience, driving under the influence of alcohol, and excessive speeding. Along with every graduated driver's licensing provision recommended by the National Highway Traffic Safety Administration (NHTSA), TADRA introduced "zero tolerance" for underage impaired driving in Georgia and a process of automatic license revocation for excessive speeding and other highly dangerous driving behaviors. In contrast to many graduated driver's licensing systems, TADRA does not allow exceptions to its provisions. It

Editor's Capsule Summary

What is already known on this topic

Graduated driver licensing systems have been adopted by 41 states to reduce teenage fatality rates from motor vehicle crashes. Although published results of these licensing statutes have been promising, regulations vary widely among states and results may vary, depending on the specifics of implementation.

What question this study addressed

This study analyzed the effects of Georgia's Teenage and Adult Driver Responsibility Act (TADRA), enacted in July 1997. Two analyses conducted shortly after the implementation of TADRA indicated a sharp decrease in teenage mortality rates from motor vehicle crashes. The goal of the investigation was to determine whether TADRA's effects were sustained during a longer period.

What this study adds to our knowledge

The investigators found that Georgia's graduated driver licensing system led to a 37% decrease in teenage mortality rates from motor vehicle crashes, which was sustained over time. The comprehensive nature of TADRA's provisions is likely a significant contributing factor to the magnitude of the sustained reduction in teenage mortality rates.

How this might change clinical practice

This study does not change clinical practice but has policy implications. States should consider the adoption of comprehensive graduated driver's licensing systems such as TADRA to reduce teenage mortality rates from motor vehicle crashes.

also includes a meaningful and inescapable sanction—automatic license revocation—for those who violate its provisions.

Goals of This Investigation

Two assessments conducted shortly after TADRA was enacted revealed that fatal crashes involving 16- and 17-year-old drivers promptly and sharply decreased.[26,27] Both evaluations were limited, however, by short follow-up intervals and possible confounding because of historical effects. To determine whether TADRA's effects were real and sustained, we analyzed data for a longer period. We also compared Georgia's experience with that of 3 neighboring states that enacted weaker graduated driver's licensing laws during the same period.[28–31]

MATERIALS AND METHODS

Data Collection and Processing

Data on fatal crashes in Georgia and the neighboring states of Alabama, South Carolina, and Tennessee were obtained from NHTSA's Fatality Analysis Reporting System (FARS). FARS captures data on all crashes in the United States that occur on public roadways and result in 1 or more deaths within 30 days of the crash. FARS includes more than 180 driver, vehicle, scene, and crash variables. It is the criterion standard for studies of this type.

Securing FARS data for calendar years 1992 through 2002 allowed us to compare fatal crash rates by various age groups of drivers for 5½ years before and after TADRA was enacted in July 1997. A "driver fatal crash" was defined as a motor vehicle crash involving a driver of a specified age that resulted in the death of the driver, another occupant of the driver's vehicle, an occupant of another vehicle struck by the driver's vehicle, a pedestrian, or multiple victims in the same crash. To calculate age-specific driver fatal crash rates, population data and intercensus estimates were obtained from the US Census Bureau for calendar years 1992 to 2002.[32] Because census and FARS data are stripped of individual identifiers, our study was granted exempt review by our university's institutional review board.

TADRA was enacted during the 1997 session of the Georgia General Assembly and took effect on July 1 of that year.[23] It contains 3 major sets of provisions. Under TADRA, a class D license is issued to persons aged at least 16 years who have held a valid instruction permit for 12 months and who, during the preceding 12 months, were not convicted of driving under the influence of alcohol, hit and run, leaving the scene of an accident, or any driving offense for which 4 or more points are assessed. Applicants must either complete an approved driver education course and 20 hours of supervised driving, including 6 hours at night, or 40 hours of supervised driving, including 6 hours at night. A parent or guardian must sign an affidavit attesting that the required hours of supervised driving were done. When it was enacted, TADRA specified that class D license holders could not legally drive between 1 AM and 5 AM. Also, class D holders could not operate a vehicle containing more than 3 passengers younger than 21 years who were not members of the driver's immediate family. These last 2 provisions were strengthened in 2001 (Appendix E1, available online at http://www.annemergmed.com).[33,34]

Class D restrictions remain in effect until age 18. At that point, an unrestricted class C license may be obtained if the driver has held a valid class D license for at least 12 months and has not been convicted of driving under the influence of alcohol, hit and run, leaving the scene of an accident, or any driving offense for which 4 or more points are assessed. No teens younger than 18 years are issued an instructional permit or driver's license unless they are enrolled in or have graduated from high school or they have a parent's permission to withdraw from school. The instructional permit or driver's license is suspended if an individual younger than 18 years drops out of school without parental permission, misses 10 consecutive days of school without an excuse, or is suspended from school for threatening or striking a teacher or school employee, possessing drugs or alcohol on school property, or possessing a weapon on school property.

Under TADRA, any individual younger than 21 years and determined to have a blood alcohol concentration of 0.02 mg/dL or more within 3 hours of driving is guilty of driving under the influence of alcohol. An offender automatically forfeits his or her driver's license for a minimum of 6 months. In Georgia, first conviction can also result in significant monetary penalties, jail time, and mandatory community service.

TADRA specifies that if drivers younger than 21 years are cited for speeding more than 24 miles per hour (MPH) over the posted limit (eg, 55 MPH in a zone posted for 30 MPH or 90 MPH in a zone posted for 65 MPH), they automatically forfeit their license for 6 months. Other offenses that trigger automatic license revocation include hit and run, leaving the scene of an accident, racing or eluding an officer, reckless driving, any traffic offense for which 4 or more points are assessed, underage purchasing or attempting to purchase an alcoholic beverage, and driving under the influence of alcohol. A first offense leads to automatic license revocation for 6 months. A second offense (or any driving under the influence of alcohol with a blood alcohol concentration of .08 or more) results in 12 months' revocation.

In 2001, the Georgia General Assembly extended TADRA's curfew hours for 16- and 17-year-old drivers to midnight to 6 AM. It also restricted who can ride with a provisional driver during the first 6 months to immediate family members.[33,34]

Primary Data Analysis

To assess TADRA's impact, we calculated driver fatal crash rates for various age strata (16, 17, 18, 19, 20, 21 to 24, and ≥25 years) for 5½ years before enactment and 5½ years immediately after enactment of the law. To identify which provisions were more effective, we examined TADRA's impact on rates of fatal crashes involving alcohol (denoted by the FARS variable "driver drinking"), speeding (denoted by the FARS variables "driving too fast for conditions" or "in excess of posted speed"), and late-night driving (denoted by the hour the fatal crash occurred). To address the possibility that any decrease in Georgia's fatal crash rate was due to historical effects such as rising rates of seatbelt use, we compared Georgia's experience with that of Alabama, South Carolina, and Tennessee, 3 neighboring states that adopted weaker versions of graduated driver's licensing during the study period (Appendix E1, available online at http://www.annemergmed.com). Finally, to determine whether TADRA might exert lasting effects on young drivers, we compared the fatal crash rate of the first cohort of 16-year-old drivers to reach age 21 under TADRA (ie, 2002) to the fatal crash rate among Georgia drivers who turned 21 in 1997, the year TADRA went into effect.

Fatal crash rates were calculated by dividing the total number of fatal crashes involving a driver of a particular age group by the number of citizens in that age group during the corresponding period and multiplying by 100,000. Rates were calculated separately for drivers aged 16, 17, 18, 19, 20, 21 to 24, and 25 years or older. Statistical significance was determined using χ^2, with α set at $P<.01$. Rate ratios and 95% confidence intervals (CIs) were calculated as well. A generalized linear model was used to examine the effect of state (Georgia versus the other 3 states), time (pre- versus postenactment), driver age, and the interaction between state and time. In this model, we used an overdispersed Poisson regression, which fit the data well.[35]

RESULTS

During the preenactment period, 317 Georgia drivers aged 16 were involved in a fatal crash (57/100,000 person-years) compared to 230 in the postenactment period (36/100,000 person-years; RR 0.63; 95% CI 0.53 to 0.75), which represents a decrease of 37% compared to the preenactment period. Before TADRA, 16-year-old Georgians had a fatal crash rate 77% higher than that of Georgians aged 25 and older. After TADRA, the rate of fatal crashes among 16-year-old drivers in Georgia was only 12.8% higher than that of drivers aged 25 and older. Enactment of TADRA was also associated with a significant decrease in fatal crashes involving 17-year-old drivers, but the decrease was not as great (54.8/100,000 preenactment to 44.4 postenactment; RR 0.81; 95% CI 0.69 to 0.95). Fatal crash rates did not increase among 18-year-old drivers or any older age group (Figure 1; Table E1, available online at http://www.annemergmed.com).

After enactment of TADRA, the rate of speed-related fatal crashes involving 16-year-old drivers was cut nearly in half, from 20.3/100,000 person-years to 10.3 (RR 0.51; 95% CI 0.38 to 0.69). Among 17-year-old drivers, speed-related fatal crashes decreased 25.1%, although this trend did not reach statistical significance. Eighteen-year-old drivers were the only age group that did not experience a decrease in speed-related fatal crash rates (Figure 2; Table E2; available online at http://www.annemergmed.com).

In Georgia, fatal crashes involving impaired drivers younger than 18 years are rare. However, once drivers reach age 18, the rate of alcohol-involved fatal crashes climbs steadily, peaking in the 21- to 24-year age group. After TADRA was enacted, alcohol-related fatal crashes involving 16-year-old drivers decreased 62.1%, from 4.1/100,000 person-years preenactment to 1.6 person-years postenactment (RR 0.38; 95% CI 0.18 to 0.80). Alcohol-related fatal crashes among 17-year-old drivers decreased as well, but the difference was not statistically significant (Figure 3; Table E3 available online at http://www.annemergmed.com).

After enactment of TADRA, late-night fatal crashes involving 16-year-old drivers decreased 18% in the midnight to 3 AM period and 36% in the 3 to 6 AM period. However, comparable or even greater decreases were noted in the 6 AM to noon intervals and between 3 PM and midnight (data not shown, Figure E1; available online at http://www.annemergmed.com).

During the 11-year study, overall rates of restraint use in Georgia gradually increased from 50.6% in 1992 to 77.0% in 2002.[36] Georgia does not report age-specific rates of restraint use. FARS reports indicate whether restraints were worn by the driver or occupants in a fatal crash but therefore offer at best only an indirect

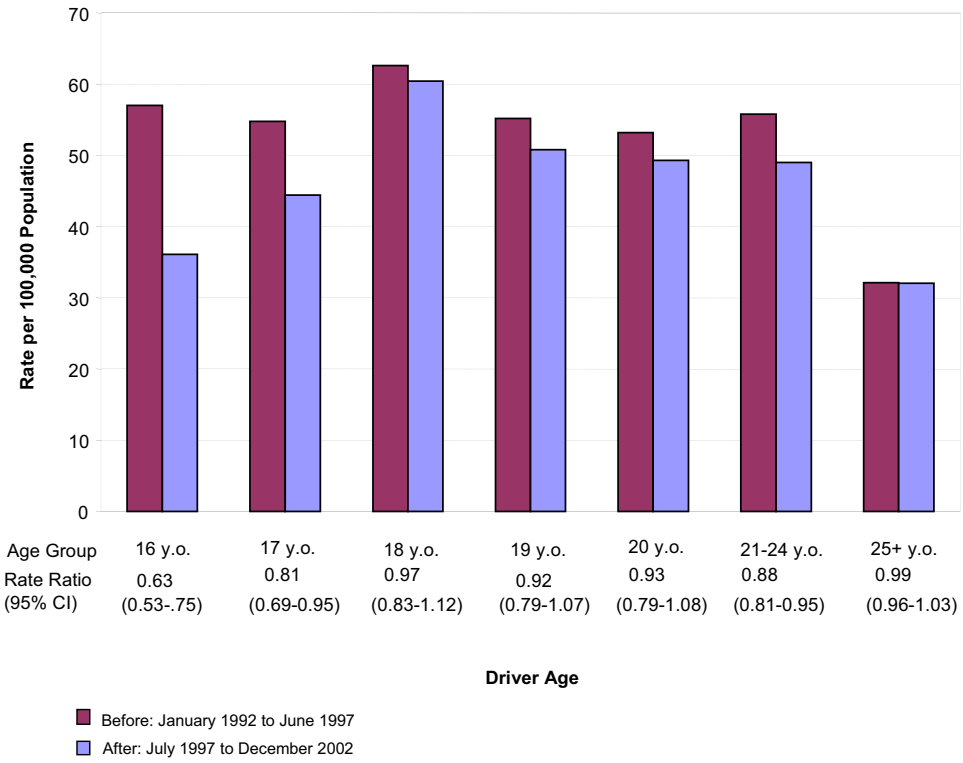

Figure 1. Fatal crash rates by driver age, pre- versus post-enactment.

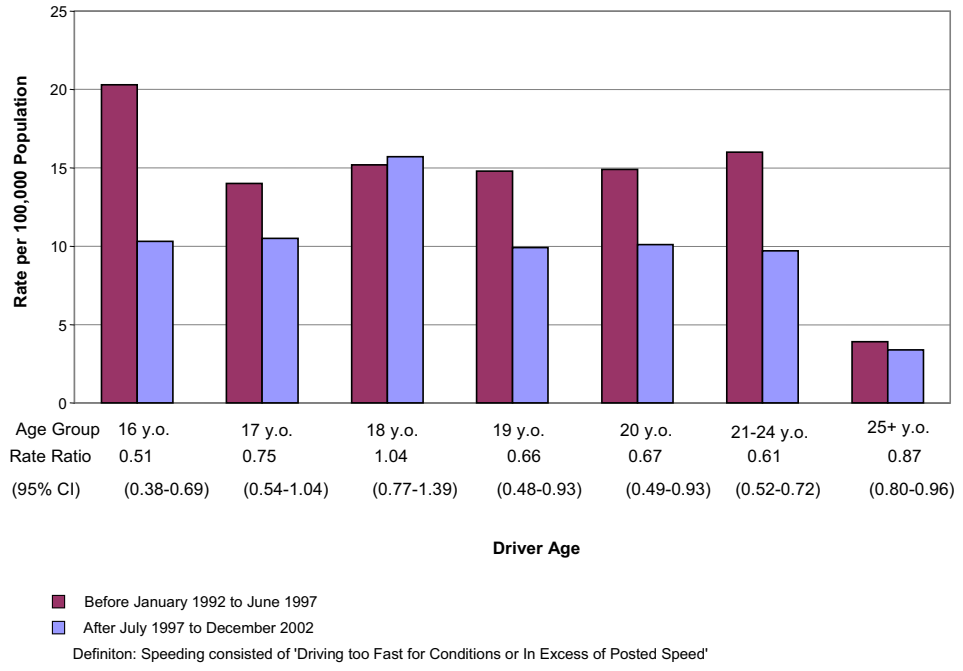

Figure 2. Speed-related fatal crash rates by driver age, pre- versus post-enactment.

measure of rates of restraint use. Although FARS data indicate that restraint use by 16-year-old Georgia drivers involved in a fatal crash significantly increased, from 34.4% in the preenactment period to 54.2% in the postenactment period, and use by 16-year-old passengers in fatal crashes increased from 29.4% preenactment to 52.7% postenactment, similar or even greater increases in restraint use were observed among other age groups that did not experience comparable decreases in fatal crash rates in the post-TADRA interval (Table E4, available online at http://www.annemergmed.com).

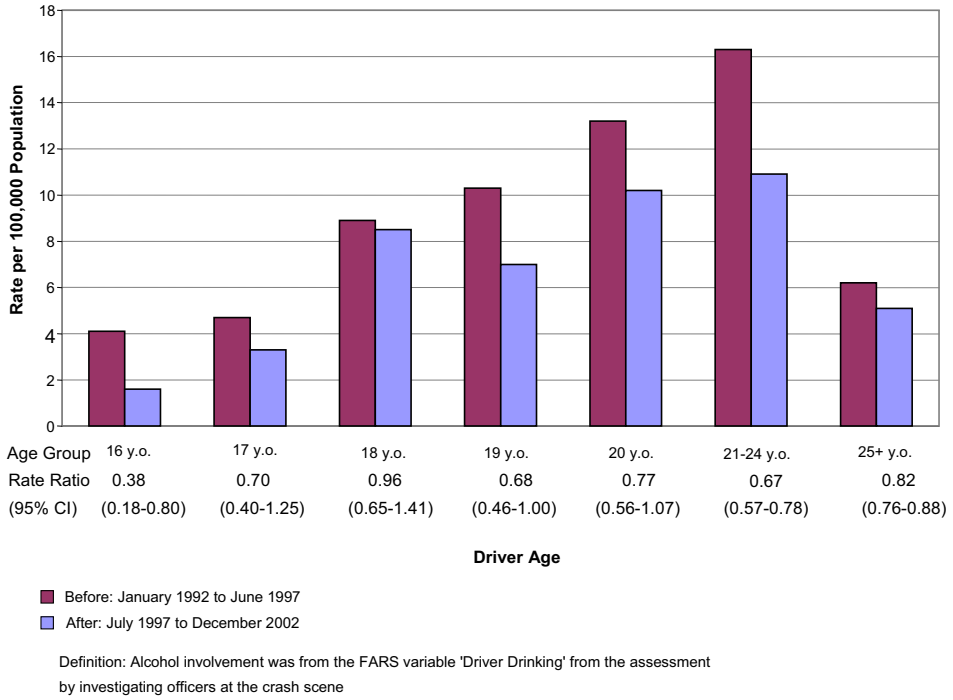

Figure 3. Alcohol-related fatal crash rates by driver age, pre- versus post-enactment.

When TADRA took effect in July 1997, the rate of fatal crashes involving 16-year-old Georgia drivers immediately decreased and did not return to preimplementation levels during the follow-up period (Figure 4A). No discernable patterns were observed in the 3 comparison states (Figure 4B-D). The decrease in Georgia was significant ($P<.01$) but not in the 3 comparison states.[35]

During the postenactment period, in Alabama there was a moderate decrease in fatal crashes involving 16- and 17-year-olds. In Tennessee, slight decreases were observed in all groups except 18-year-olds. In South Carolina, fatal crash rates increased in all age groups (Table E5; available online at http://www.annemergmed.com). Before TADRA, fatal crash rates among 16-year-old Georgia drivers were similar to those of 16-year-old drivers in the 3 comparison states. After TADRA, Georgia's rate of fatal crashes involving 16-year-old drivers was 32% lower than Alabama's, 18% lower than South Carolina's, and 34% lower than Tennessee's.

The first group of 21-year-old drivers to grow up under TADRA (ie, turned 21 in 2002) had a fatal crash rate 38% lower than that of Georgia drivers who turned 21 in 1997, the year that TADRA was enacted. Speed-related fatal crashes of 21-year-old drivers in 2002 were half that of 21-year-old drivers in 1997, and the rate of alcohol-involved fatal crashes was 74% lower. Individuals involved in a fatal crash in 2002 had fewer previous convictions for speeding, driving under the influence of alcohol, or other dangerous driving infractions and fewer license suspensions for any reason than those who were involved in a fatal crash in 1997 (Table E6, available online at http://www.annemergmed.com).

LIMITATIONS

Local or state law enforcement officers compile FARS reports at the scene of the crash. It is possible that officers' notation of contributing factors to a crash may be influenced by enforcement priorities in vogue at the time. We hoped to track enforcement of TADRA by analyzing driver's license suspensions before and after enactment. Unfortunately, state officials did not compile revocation data with sufficient rigor to allow this. Anecdotally, news of license suspensions circulated widely among teens, possibly amplifying the law's deterrent effect.

Increasing usage of safety belts may have contributed somewhat to the overall decrease in fatal crash rates in the postenactment period,[37,38] but it is unlikely that belt use was the determining factor in the sharp decrease among 16-year-olds. First, safety belt use by drivers and occupants involved in fatal crashes increased more among Georgia's 18-year-olds than among 16-year-olds, without a commensurate decrease in fatal crash rates. Second, there is no reason to believe that safety belt use by 16-year-olds increased more in Georgia than in the 3 comparison states. Finally, if restraint usage was, indeed, the determining factor, we would have expected fatal crash rates of 16-year-old drivers to steadily decrease. Instead, we observed an abrupt and sustained decrease in fatal crashes that coincided with enactment of TADRA (Figure 4A).

In the past, highway safety researchers used counts of licensed drivers as the denominator for calculating fatal crash rates. Unfortunately, it is no longer possible to obtain consistent state-specific data about licensed drivers in the youngest age

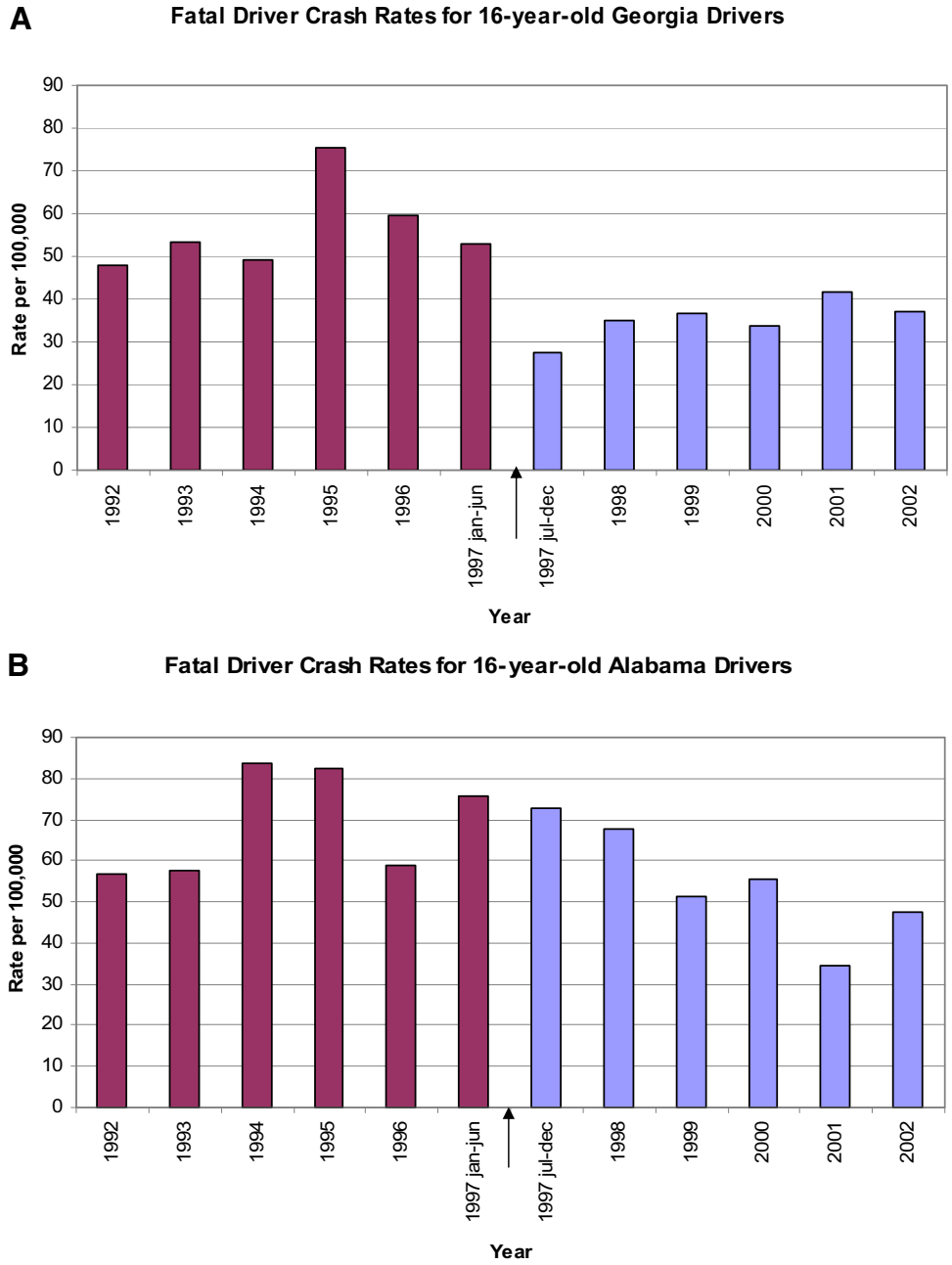

Figure 4. Annual fatal crash rates involving 16-year-old drivers in *A*, Georgia; *B*, Alabama; *C*, South Carolina; *D*, Tennessee. Continued.

groups. The only national source of information on licensed drivers is the Federal Highway Administration's Highway Statistics Series Table DL-22.[39] In 1989, a Federal Highway Administration committee decided that the enumeration of licensed drivers should not include class P (ie, instructional permit) holders or drivers with limited-use or restricted licenses. As a result of this rule change, Federal Highway Administration statistics significantly undercount drivers in the youngest age groups, in which issuance of class P and class D restricted licenses is common, especially in states with graduated driver's licensing laws.

If TADRA merely discouraged many 16-year-olds from obtaining a driver's license, the decrease in fatal crash rates post-TADRA might be due to fewer young drivers on the road, rather than any meaningful change in driver behavior. State statistics indicate otherwise. Between 1992 and 2002, the annual number of 16-year-olds obtaining a driver's license in Georgia grew by 24.5% (unpublished data, Georgia Department of Motor Vehicles). Unfortunately, we could not obtain comparable statistics from the comparison states. Had tens of thousands of 16-year-olds delayed licensure because of TADRA, we should have seen more fatal

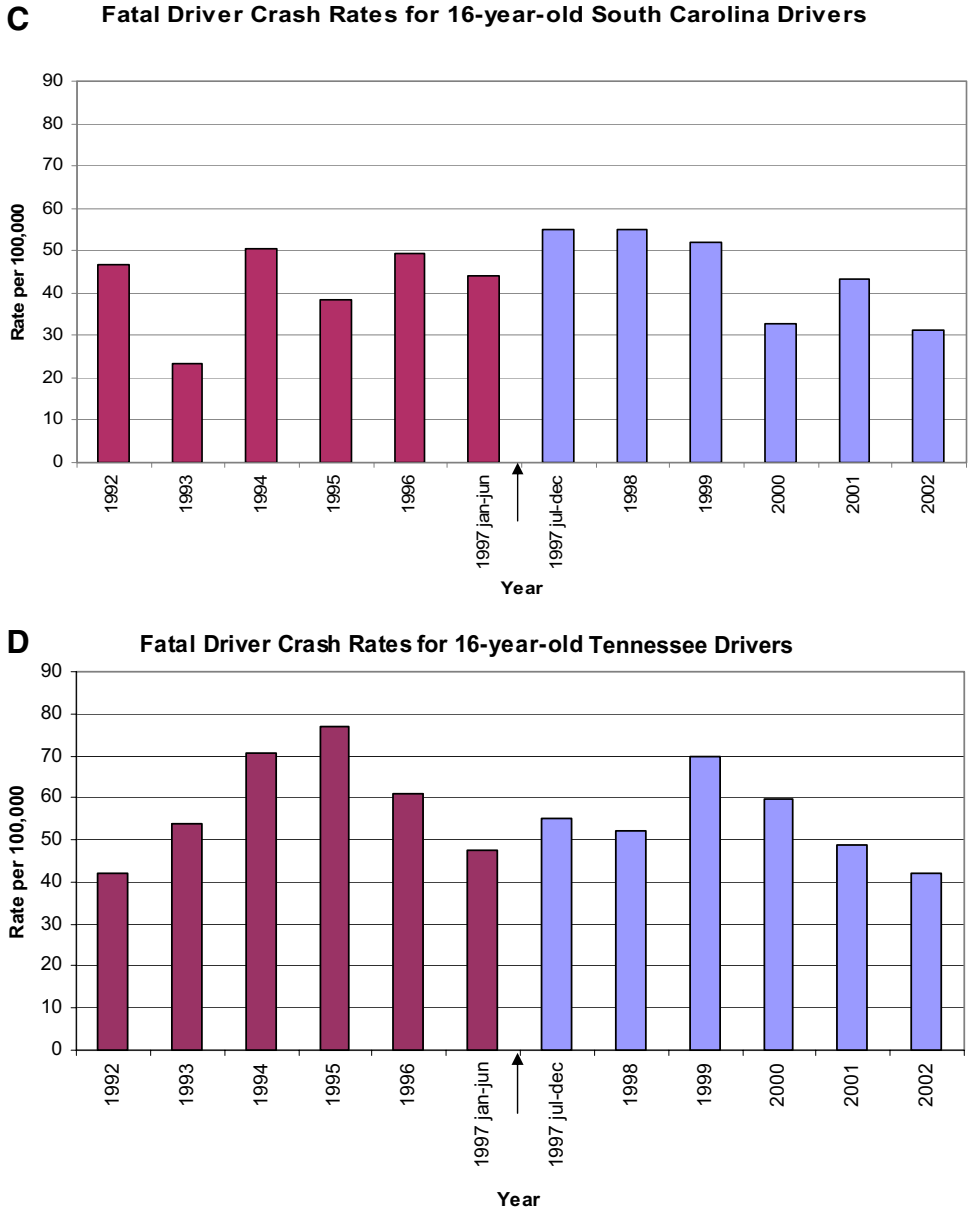

Figure 4. Continued.

crashes in older age groups when they finally began driving, which did not occur.

DISCUSSION

The first assessment of TADRA shortly after it was enacted indicated that the law had an immediate and positive effect on fatal crashes involving 16- and 17-year-old drivers.[26] A second assessment conducted 18 months postenactment determined that the rate of fatal crashes involving 16- and 17-year-old drivers was 30% lower than before enactment.[27] We sought to determine whether these effects were sustained over time and whether certain provisions of TADRA were more effective than others.

Our study differs from previously published assessments of graduated driver's licensing laws in several respects. First, instead of focusing exclusively on 16-year-old drivers, we studied all age strata, which allowed us determine whether fatal crashes were displaced to older age groups. Second, we used a much longer follow-up interval (5½ years) than previous studies did. Third, TADRA differs in important respects from most states' graduated driver's licensing laws. In addition to including all of NHTSA's recommended elements for graduated driver's licensing; TADRA contains supplemental provisions designed to deter driving under the influence of alcohol, excessive speeding, and other dangerous driving behaviors. It also contains a certain and highly meaningful sanction—automatic

license revocation—for individuals who violate its provisions. Finally, rather than simply report Georgia's experience, we compared it to that of 3 neighboring states, a strategy recommended by McCartt.[40]

Our findings suggest that TADRA has achieved impressive results. Five and a half years after enactment, the fatal crash rate of 16-year-old Georgia drivers was 37% lower than in the preenactment period. This effect size is equal to that reported in states in which graduated driver's licensing has been most successful (Appendix E2, available online at http://www.annemergmed.com). We found no evidence of displacement to older age groups. In fact, fatal crashes involving 17-year-old drivers also decreased.

Before TADRA, speeding accounted for one third of all fatal crashes involving 16-year-old drivers in Georgia. After TADRA, speed-related fatal crashes involving this age group were cut in half. Alcohol-related fatal crashes decreased by more than 60%. These findings suggest but do not prove that TADRA's supplemental provisions were important contributors to the overall impact of the law.

To exclude historical effects, we compared Georgia's experience to that of 3 neighboring states that adopted weaker versions of graduated driver's licensing.[28–31,41] Two of the 3 states experienced modest decreases in fatal crash rates, whereas rates increased in the third state. None of the 3 states experienced decreases as great as those observed in Georgia. Nationwide, fatal crash rates involving 16-year-old drivers decreased an average of 14.8% during the 11-year study, half of that observed in Georgia during the same period.

Why was TADRA not more effective among older teens? At age 16, most teens are still living at home and subject to the supervision of parents or guardians.[42,43] By 17 years of age, many adolescents have acquired enough driving experience to become overconfident. They may also be less responsive to parental disapproval. By age 18 years, many teens are living independently. They may also find it easier to obtain alcohol.

One way to quantify the potential impact of TADRA is to project the number of fatal crashes that might have occurred if Georgia had not adopted the law. Using Alabama's moderate decrease in fatal crash rates as the "best case" and South Carolina's increase as the "worst case," between 220 and 430 additional fatal crashes might have occurred during the 5½-year follow-up interval if the Georgia General Assembly had failed to enact TADRA. Because a fatal crash can claim more than 1 life, the number of lives saved was probably higher still.

In conclusion, enactment of TADRA was associated with a 37% decrease in the rate of fatal crashes involving 16-year-old drivers. Fatal crashes were not displaced to older age groups. TADRA's benefits were sustained over time. If other states adopt similarly comprehensive approaches to graduated driver's licensing, they may realize similar benefits.

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Author contributions: AR, MW, and AK conceived the study, designed the analysis, and obtained research funding. AR and MW obtained the FARS and US Census data. AR conducted key data analyses, assisted by SN, KD and MEP. SN and KD created the tables and figures. MEP conducted additional statistical analyses. MW researched the legislative history and legal review; AK drafted the manuscript, and all authors contributed substantially to its revision. AK and AR take responsibility for the paper as a whole.

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Table E1. Georgia drivers in fatal crashes before and after enactment of TADRA, number and rate per 100,000 population.*

Driver's Age, y	Before		After		Change in Age-Specific Rate, %	Rate Ratio	95% CI
	Number	Rate	Number	Rate			
16	317	57.0	230	36.1	−36.8	0.63	0.53–0.75
17	306	54.8	284	44.4	−19.1	0.81	0.69–0.95
18	339	62.6	385	60.4	−3.5	0.97	0.83–1.12
19	316	55.2	335	50.8	−7.8	0.92	0.79–1.07
20	306	53.2	324	49.3	−7.2	0.93	0.79–1.08
21–24	1,300	55.8	1,228	49.0	−12.1	0.88	0.81–0.95
>24	7,882	32.1	8,991	32.0	−0.5	0.99	0.96–1.03

*Before January 1992 to June 1997; after July 1997 to December 2002.

Table E2. Drivers in speeding-related fatal crashes in Georgia before and after enactment of TADRA, number and rate per 100,000 population.*

Driver's Age, y	Before		After		Change in Age-Specific Rate, %	Rate Ratio	95% CI
	Number	Rate	Number	Rate			
16	113	20.3	66	10.3	−49.12	0.51	0.38–0.69
17	78	14.0	67	10.5	−25.12	0.75	0.54–1.04
18	82	15.2	100	15.7	3.63	1.04	0.77–1.39
19	85	14.8	65	9.9	−33.52	0.66	0.48–0.92
20	86	14.9	66	10.1	−32.75	0.67	0.49–0.93
21–24	373	16.0	244	9.7	−39.12	0.61	0.52–0.72
>24	963	3.9	965	3.4	−12.63	0.87	0.80–0.96

*Before January 1992 to June 1997; after July 1997 to December 2002.

Table E3. Drivers in alcohol-involved fatal crashes in Georgia before and after enactment of TADRA, number and rate per 100,000 population.*

Driver's Age, y	Before		After		Change in Age-Specific Rate, %	Rate Ratio	95% CI
	Number	Rate	Number	Rate			
16	23	4.1	10	1.6	−62.12	0.38	0.18–0.80
17	26	4.7	21	3.3	−29.59	0.70	0.40–1.25
18	48	8.9	54	8.5	−4.4	0.96	0.65–1.41
19	59	10.3	46	7.0	−32.22	0.68	0.46–1.00
20	76	13.2	67	10.2	−22.74	0.77	0.56–1.07
21–24	381	16.3	273	10.9	−33.31	0.67	0.57–0.78
>24	1521	6.2	1428	5.1	−18.14	0.82	0.76–0.88

*Before January 1992 to June 1997; after July 1997 to December 2002.

Table E4. Seat belt usage by drivers and passengers in fatal crashes in Georgia before and after enactment of TADRA, number and percentage belted.*

Driver's Age, y	Occupant	Before		After		Change, %	Rate Ratio	95% CI
		Number	Rate	Number	Rate			
16	Driver	109	34.4	125	54.3	19.9	2.27	1.60–3.22
	Passenger	102	29.4	128	52.7	23.3	2.67	1.90–3.76
	Total occupants	211	31.8	253	53.5	21.7	2.47	1.94–3.15
17	Driver	94	30.7	167	58.8	28.1	3.22	2.29–4.52
	Passenger	84	30.2	123	50.8	20.6	2.39	1.67–3.42
	Total occupants	178	30.5	290	55.1	24.6	2.80	2.19–3.58
18	Driver	86	25.4	185	48.1	22.7	2.72	1.98–3.73
	Passenger	66	22	166	62.2	40.2	5.83	4.03–8.42
	Total occupants	152	23.8	351	53.8	30	3.74	2.94–4.74
>24	Driver	2,911	36.9	4,998	55.6	18.7	2.14	2.01–2.28
	Passenger	1,281	32.2	2,324	46.1	13.9	1.80	1.65–1.96
	Total occupants	4,192	35.3	7,322	52.2	16.9	2.00	1.90–2.10

*Before January 1992 to June 1997; after July 1997 to December 2002.

Table E5. Drivers in fatal crashes before and after enactment of TADRA by state, number and rate per 100,000 population.*

Driver's Age, y	Before			After			Rate Ratio	95% CI
	Population	Number	Rate	Population	Number	Rate		
Georgia								
16	555,849	317	57.0	638,024	230	36.1	0.63	0.53–.75
17	557,993	306	54.8	640,103	284	44.4	0.81	0.69–0.95
18	541,423	339	62.6	637,158	385	60.4	0.97	0.83–1.12
19	572,815	316	55.2	658,934	335	50.8	0.92	0.79–1.07
20	575,712	306	53.2	656,951	324	49.3	0.93	0.79–1.08
21–24	2,331,907	1,300	55.8	2,505,619	1,228	49.0	0.88	0.81–0.95
>24	24,531,405	7,882	32.1	28,135,895	8,991	32.0	0.99	0.96–1.03
Alabama								
16	337,896	232	68.7	344,089	183	53.2	0.77	0.64–0.94
17	353,025	235	66.6	358,083	201	56.1	0.84	0.70–1.02
18	341,222	206	60.4	354,695	264	74.4	1.23	1.03–1.48
19	356,925	257	72.0	363,441	274	75.4	1.05	0.88–1.24
20	355,836	253	71.1	361,162	242	67.0	0.94	0.79–1.12
21–24	1,402,550	916	65.3	1,356,391	806	59.4	0.91	0.83–1.00
>24	14,911,945	5,838	39.1	15,838,143	5,788	36.5	0.93	0.90–0.97
South Carolina								
16	286,289	120	41.9	300,453	132	43.9	1.05	0.82–1.34
17	298,994	133	44.5	317,600	168	52.9	1.19	0.95–1.49
18	291,490	197	67.6	318,643	224	70.3	1.04	0.86–1.26
19	309,390	175	56.6	333,955	211	63.2	1.12	0.91–1.37
20	311,976	204	65.4	335,888	234	69.7	1.07	0.88–1.29
21–24	1,258,835	747	59.3	1,244,555	775	62.3	1.05	0.95–1.16
>24	12,873,265	4,478	34.8	14,237,855	5,664	39.8	1.14	1.10–1.19
Tennessee								
16	399,159	239	59.9	423,456	231	54.6	0.89	0.74–1.07
17	402,611	268	66.6	430,360	242	56.2	0.84	0.71–1.01
18	389,264	289	74.2	426,157	332	77.9	1.05	0.90–1.23
19	408,101	291	71.3	437,879	321	73.3	1.0281	0.88–1.21
20	408,573	285	69.8	435,493	302	69.3	0.99	0.85–1.17
21–24	1,641,313	1,021	62.2	1,651,956	994	60.2	6.60	6.18–7.05
>24	18,550,441	6,407	34.5	20,369,597	6,783	33.3	0.96	0.930–1.00

*Before January 1992 to June 1997; after July 1997 to December 2002.

Table E6. Characteristics of drivers aged 21 years in fatal crashes in Georgia after enactment of TADRA compared with drivers aged 21 years in 1997 before TADRA enactment, number and rate per 100,000 population.*

	Age 21 y in 1997		Age 21 y in 2002		Change in Age-Specific Rate, %	Rate Ratio	95% CI
	Number	Rate	Number	Rate			
Driver History							
Speeding convictions	51	50.1	25	19.5	−61.1	0.39	0.24–0.63
Alcohol convictions	7	6.9	2	1.6	−77.3	0.23	0.05–1.09
Other convictions	29	28.5	12	9.4	−67.1	0.33	0.17–0.65
License suspensions	26	25.3	9	7	−72.5	0.28	0.13–0.59
Driver crash event							
Total crashes	72	70.7	56	43.7	−38.2	0.62	0.44–0.88
Speeding crashes	24	23.6	15	11.7	−50.4	0.50	0.26–0.94
Alcohol crashes	27	26.5	9	7	−73.6	0.26	0.12–0.56

*Before January 1992 to June 1997; after July 1997 to December 2002.

Appendix E1. Comparisons of key features of the graduated licensing laws for Georgia, Alabama, Tennessee, and South Carolina (as of August 31, 2004).

Specific Feature of Law, Date(s) Implemented	Georgia, 2001, Revised	Alabama, 2002	Tennessee, 2001	South Carolina, 1998
Learners' permits				
Driving permits can be issued to persons as young as 15 y	X	X	X At 14 if a hardship situation is proven	X
Written parental consent required to secure a permit (legal guardians and other legally recognized family members >21 y may consent as well)	X	X	X With proof of insurance	X
Graduated license process				
Written parental consent required to secure a conditional license (legal guardians and other legally recognized family members >21 y may consent as well)	X	X	X With proof of insurance	
Conditional license issued after specified number of months	X 12 mo	X 12 mo	X 6 mo	X 6 mo
Conditional license issued after documented number of hours of behind-the-wheel driving with licensed parent or guardian	X 40 h (6 At night)	X 30 h	X 50 h (10 At night)	X 40 h (10 At night)
Conditional license issued after documented successful completion of a high school drivers' education class or a state-authorized driving school to fulfill behind-the-wheel experience	X	X		X
Age of driving instructor limited to ≥21 y (parents, guardians, or other instructors)	X			
Conditional license issued after the successful completion of a written test	X	X	X	X
Passenger restrictions				
Restrictions about the number of passengers in vehicle of conditional license holder	X Not >3	X Not >3	X >4	X >1	X >2
During the first 6 mo of a conditional license, only immediate family members can be transported by the driver	X			
Specific features of law				
Curfews				
Holders of a conditional license are subject to a curfew period when they are not allowed to drive	X 1-5 AM	X Curfew extended to midnight–6 AM	X Midnight–6 AM	X 11 PM–6 AM	X Midnight–6 AM
Suspension of license: linkage to secondary education				
Provisions to address and link school suspension and expulsion information from state Department of Education to suspension of conditional license by DMV	X	X		X
Conditional license issuance and rights linked to school attendance or successful secondary school completion (eg, graduation or GED)	X	X	X	X
Suspension of license: moving violations				
Written request for revocation of license may be made by parent, guardian, or other legally recognized adult			X	
Conditional driver with 4 or more points on his or her license for moving violations will have license suspended (such violations include reckless driving, not wearing a seatbelt, leaving the scene of an accident, hit and run, resisting or eluding law enforcement officers)	X	X	X Six points required, rather than 4 points	

Appendix E1. Comparisons of key features of the graduated licensing laws for Georgia, Alabama, Tennessee, and South Carolina (as of August 31, 2004).

Specific Feature of Law, Date(s) Implemented	Georgia, 2001, Revised		Alabama, 2002	Tennessee, 2001	South Carolina, 1998
Conditional driver with 2 suspensions of his or her license will have license revoked and have to undergo a period revocation and retesting/reapplication		X	X	X	
Suspension of license: DUI					
"Zero tolerance" for any driver <21 y with a BAC >.02, which will lead to immediate suspension of his or her license	X	X			X
Specific features of the law					
Conditional driver arrested for DUI with a BAC of <.08 will have a 6-mo revocation of license		X	X		
Conditional driver arrested for DUI with a BAC of >.08 will have his or her license revoked and will have to undergo a retest of on-road driving skills		X			
Conditional drivers arrested for DUI will spend a minimum of 1 day in jail, perform 40 hours of community service		X			
Exemptions					
Individuals who are ≥16 y, who are married, emancipated minors, or heads of household are exempt from the conditional licensing process	No	No	Yes	No	No
Behind-the-wheel driving experience may be waived at the request of parent or guardian	No	No	Yes	No	No
Exemption to conditional licensing process for high school graduates <18 y	No	No	No	Yes	No
Exemptions about the number of passengers for occasions in which conditional license holder is transporting parent(s) or guardian(s) or going to and from school with siblings or other unrelated individuals	No	No	Yes	Yes	Yes
Modifications to increase the number of passengers may be requested and granted on petition of parent(s), guardian(s), or school officials	No	No	Yes	No	Yes
Specific feature of the law					
Curfew exceptions for conditional license holders allow them to drive if they are driving to and from work, in an emergency situation, to or from a religious event, with parent(s) or guardian(s) in car	Yes	Rescinded	X	X Written note required; hunting/ fishing trip included too	X Also includes travel for opportunity for employment
Exemptions to this law for military personnel	No	No	Yes	Yes	Yes
Exemptions to this law for drivers from other states, with valid licenses	No	No	Yes	Yes	Yes
Exemptions for the driving of agricultural vehicles by minors	Yes	Yes	Yes	Yes	Yes
Insurance Institute of Highway Safety's rating of state GDL law (Williams and Mayhew[41])	n/a	Good	Fair	Good	Marginal

BAC, Blood alcohol concentration; *DUI*, driving under the influence of alcohol.

Appendix E2. Peer-reviewed evaluations of state graduated licensing laws.*

State	Date Enacted	Periods Evaluated	Populations Studied	Effect Size Reported
Florida (Ulmer, 2000)	7/1996 Amended 2001	1995 Vs 1997	Primary group: 17-y-old drivers, with analyses of 15, 16, and 18-y-olds Comparison groups: 25- to 54-y-old drivers; Florida data compared to that of similar age groups in Alabama	Fatal or injury crashes for 16-y-old drivers: 1995: 5,570/172,554 population estimate for 16-y-olds 1996: 5,781/182,640 population estimate for 16-y-olds 1997: 5,388/185,689 population estimate for 16-y-olds Postenactment decrease per 1,000 16-y-old drivers: −10%
Kentucky (Agent, 2001)	10/1996	1993–1995 Vs 1997–1999	Primary group: 16- to 17-y-olds Comparison groups: 19-y-olds and above	Postenactment decreases per 1,000 16-y-old drivers: Crashes: −30% Injury crashes: −33% Fatal crashes: −31%
Michigan (Shope, 2001)	4/1997	1996 Vs 1998 and 1999	Primary group: 16-y-olds Comparison group: Drivers ≥25 y	Driver fatal crashes for 16-y-olds: 1996: 54/1,000 population 1998: 41/1,000 population 1999: 37/1,000 population Adjusted risk of a fatal crash among 16-y-old drivers: −25%
North Carolina (Foss, 2001)	12/1997	1999 Vs 1996 1999 vs 1997	Primary group: 16-y-olds Comparison group: drivers 25–54 y	Driver fatal crashes for 16-y-olds: 1996: 5/1,111 all crashes per 10,000 population 1997: 5/1,181 all crashes per 10,000 population 1999: 2/855 all crashes per 10,000 population Postenactment decrease in fatal crash rate per 1,000 16-y-old drivers: −57%
Ohio (Kilgore, 2001)	10/1997 Amended 2004	1988–1999 Subanalyses for 1999 vs 1996 and 1997	Primary group: 16-y-olds Comparison group: drivers 25–54 y old	Driver fatal crashes for 16-y-olds: 1996: 57/10,000 registered drivers 1997: 49/10,000 registered drivers 1999: 47/10,000 registered drivers 1988: 64/10,000 registered drivers Postenactment reduction in fatal crash rate per 1,000 16-y-old drivers: −17.5%
Utah (Hyde, 2004)	7/1999	1/1996–6/1999 7/1/1999–6/30/2001	Primary group: 16-y-olds	Postenactment crashes per 1,000 16-y-old drivers: total crashes: −5%; injury crashes: no significant difference

*Principal author of article used to extract data in parentheses beneath state name.

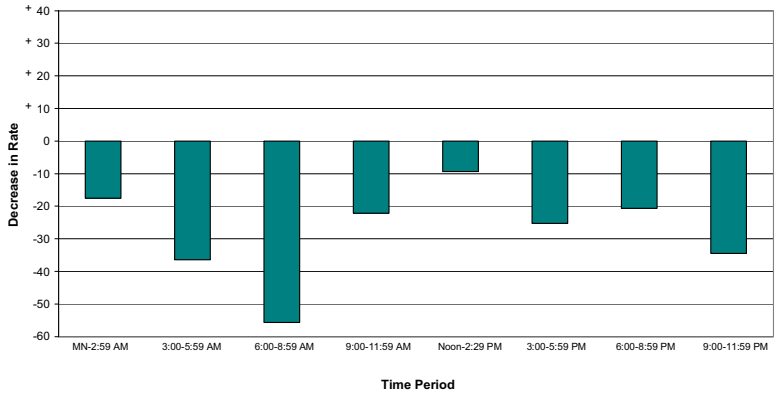

Figure E1. Percent change in fatal crash rates involving 16-year-old drivers by time of day before and after enactment of TADRA in Georgia, 1992-2002. (Rate per 100,000 population).