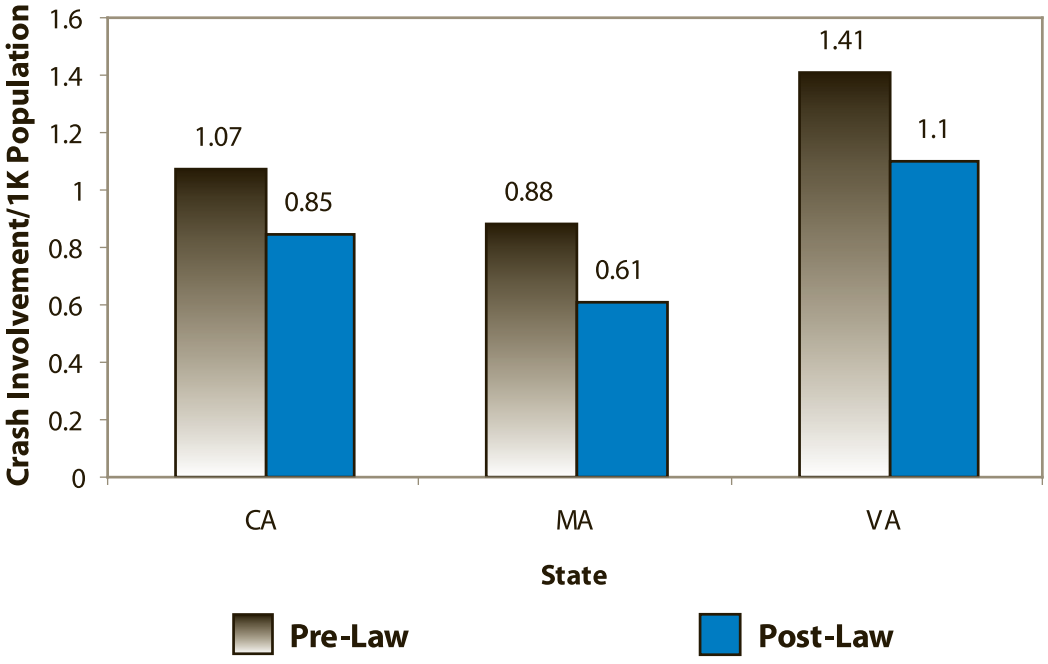
Evaluation and Compliance of Passenger Restrictions In a Graduated Driver Licensing Program



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16. Abstract

Teen drivers are several times more likely to become involved in a crash when traveling with one, two, and three or more passengers as compared to traveling alone. Graduated Driver Licensing (GDL) laws in 37 States (as of January 2007) limit the number of passengers that may travel with a newly licensed 16-year-old driver. The effects of these laws were evaluated in three States: California (compared with Arizona), Massachusetts (compared with Connecticut), and Virginia (compared with Maryland). Time series analysis showed that 16-year-old driver crash involvements were reduced (740 per year in California; 173 in Massachusetts; and 454 in Virginia) as were motor vehicle related injuries among 15- to 17-year-olds (drivers, passengers, pedestrians, or bicyclists) in all three States. Parents and teens in focus groups reported that the restriction was often violated. Police reported that the law was often difficult to enforce. Nevertheless, even incomplete adherence to the law had a positive impact on both teen driver crashes and injuries.

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Background

There is greatly increased crash risk when teenage drivers transport passengers, and the more passengers, the greater the risk. Risk increases exponentially with one, two, or three or more passengers, such that when there are multiple passengers in the vehicle, crash risk is 3-5 times greater than when driving alone. Passenger presence is associated with increased crash risk for both male and female teen drivers; risk is greater for younger teens ages 16-17 than for older teen drivers; and the increased risk with passengers has been found for all types of crashes: property damage, nonfatal injury, and fatal (Doherty et al., 1998; Chen et al., 2000; Williams & Ferguson, 2002).

California enacted the first meaningful passenger restriction law in 1998 with the goal of reducing crashes associated with teens driving with other teens. With California acting as a trend setter, most subsequent graduated driver licensing (GDL) legislation included passenger restrictions, and some of the earlier States amended their legislation. As of January 2007, 45 States and the District of Columbia have general nighttime restrictions, and 37 States plus the District of Columbia have passenger restrictions.

Objective

This project evaluated the passenger restriction component of a GDL program on teen crashes and fatalities. It also assessed compliance with and enforcement of the passenger restriction of a GDL law among teen drivers, parents of teen drivers, and law enforcement personnel.

Method

California, Massachusetts, and Virginia were chosen as study States. Each State was paired with a matching comparison State (Arizona for California, Connecticut for Massachusetts, and Maryland for Virginia) to help control for confounding variables. Time series analyses were run on crash data from these States. The following series were analyzed:

- Sixteen-year-old driver crash involvements per 1,000 population
- Fifteen- to 17-year-old driver crash involvements per 1,000 population

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- Highway injury/death of 16-year-olds whether as drivers, passengers, or nonoccupant per 1,000 population
- Highway injury/death of 15- to 17-year-olds per 1,000 population
- Sixteen-year-old drivers driving with teen passengers (i.e., likely in violation of the passenger restriction)
- Thirty-five- to 49-year-old driver crash involvements per 1,000 population
- Eighteen- to 19-year-old driver crash involvements per 1,000 population
- Highway injury/death of 18- to 19-year-olds per 1,000 population
- Twenty- to 34-year-old driver crash involvements per 1,000 population

Focus groups discussions were held with teen drivers, parents of teen drivers, and police officers in all three States.

Results

The crash data analyses support the contention that passenger restrictions reduce crashes among 16-year-old drivers. This decrease does not appear to be offset by increases in other types of crashes or an increase in overall injuries. Results indicate that in California there are, on average, 740 fewer 16-year-old drivers involved in crashes each year. In Massachusetts the average annual reduction is 173, and in Virginia it is 454 (See Table). There was also a reduction in the number of 15- to 17-year-olds injured in any capacity in motor vehicle crashes. There was an estimated average annual reduction in these injuries of 2,433 in California, 1,122 in Massachusetts, and 759 in Virginia.

Table 1. Reduction in Highway Loss

	16-year-old driver crash involvements		15- to 17-year-old injuries (all MV related)	
State	Monthly Δ per 1k pop.	M Annual Δ	Monthly Δ per 1k pop.	M Annual Δ
CA	-0.13	740	-0.14	2,433
MA	-0.16	173	-0.35	1,122
VA	-0.38	454	-0.21	759

The focus groups indicated that there are some difficulties with the law. Parents were sometimes inconvenienced by the law and failed to enforce it when they knew the teen passengers who would be riding with their child. Teens, too, were inconvenienced and reported violating the restriction on occasion. The police indicated that the law is often difficult to enforce.

Conclusion

There are factors that likely lead to incomplete adherence to the passenger restriction requirements. Despite this, results indicate that the passenger restrictions reduce crashes and injuries to young teens (15-17 years old) without measurable offsetting increases among other age groups.

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I. INTRODUCTION

Passengers and Crash Risk

It is widely accepted that passenger presence in a vehicle can affect driving behavior. The effects can be positive or negative. Passengers can assist the driver by warning of impending dangers, helping with navigation, keeping the driver alert, or influencing more careful driving through their presence or their actions. On the other hand, passengers can distract drivers, making the driving task more difficult, or influence them to drive in a more risky manner than they otherwise would.

Research has indicated that crash risk is strongly related to passenger presence, but that the risk is dependent on age and gender of the driver and passenger(s), and their relationship. Early research indicated that young drivers were more likely to crash if passengers were present (Foldvary & Lane, 1969), and recent research has confirmed and extended this finding (Aldridge et al., 1999; Chen et al., 2000; Doherty, Andrey, & McGregor, 1998; Preusser, Ferguson & Williams, 1998; Padlo, Aultman-Hall, & Stamatiadis, 2005; Lam et al., 2003; Reiss & Kruger, 1995). In brief, there is greatly increased crash risk when teenage drivers transport passengers, and the more passengers, the greater the risk. Risk increases exponentially with one, two, or three or more passengers, such that when there are multiple passengers in the vehicle, crash risk is three to five times greater than when driving alone. Passenger presence is associated with increased crash risk for both male and female teen drivers; risk is greater for younger teens ages 16-17 than for older teen drivers; and the increased risk with passengers has been found for all types of crashes: property damage, nonfatal injury, and fatal (Doherty et al., 1998; Chen et al., 2000; Williams & Ferguson, 2002). On the other hand, these same studies indicate that for older drivers, passenger presence is associated with no change in risk or, more frequently, decreased risk.

Despite the overall substantial increase in crash risk for teenage drivers, risk varies according to passenger gender and age, and in some cases, risk for teen drivers is actually lowered. One of these situations is when the passenger is an adult (age 25 and older) or a child (age 12 and younger) (Aldridge et al., 1999). Crash risk is higher when teens are transporting their peers, but there is an exception. Crash risk is reduced when a male teen is transporting a female teen. The highest risk scenarios for teens transporting teens are when male passengers are involved, whether with male or female drivers (Chen et al., 2000).

Teens transporting teens is a high-exposure activity as well as a high-risk event. It is a major factor contributing to teen passengers having a much higher death rate per capita than any other age group, with about two-thirds of their deaths occurring in cars driven by other teenagers (Insurance Institute for Highway Safety, 2005). Overall, teens transporting young people account for a large portion of the deaths that occur in the crashes of teenagers. In 1995, prior to graduated licensing, 55% of the deaths that occurred in the crashes of 16- to 17-year-old drivers involved unsupervised transportation of passengers under the age of 20 (Williams & Ferguson, 2002). These are deaths that would be potentially addressed by passenger restrictions. In contrast, only

11% of the total deaths occurred between midnight and 5 a.m., the most popular time for night driving restrictions.

Reasons for the Effects of Passengers on Crashes

The mechanisms by which passenger presence increases or decreases crash risk are not fully understood. Presumably, the association of decreased risk for older drivers when transporting passengers is at least partly due to passengers assisting with the driving task or influencing the driver in positive ways. Much more attention has gone into trying to explain the altered crash risk for teenage drivers—up in most cases, down in some—when passengers are present. When older passengers are present, who in many cases are parents, it is understandable that teen drivers will be on their best behavior (Rolls et al., 1991), and young males generally acknowledge that when they are transporting young females, they take care to drive conservatively (Rolls & Ingham, 1992; Ulleberg, 2005).

In the high-risk scenarios involving teens transporting teens, distraction and enhanced risk-taking, singly or in combination, are thought to be involved. Young drivers are inexperienced and need greater attention to the driving task than adults with more driving experience. The presence of passengers by itself gives the driver an added stimulus to respond to, and passengers can create distraction through talk, laughter, and movement. Loud music and use of cell phones or other communication devices may also add to the distraction. In focus groups and attitude surveys, about half of the teens surveyed said that they sometimes get distracted by other people's presence in their vehicles, and that they drive more safely without friends in the car (Allstate Foundation, 2005). Research has shown that in the presence of a talking passenger, performance on driving simulator tasks is negatively affected (Reiss & Kruger, 1995).

Risk-taking can also be induced by the presence of passengers. Farrow (1987) asked teenagers to describe all the dangerous driving situations they had participated in within the last 6 months. The 192 respondents in this study described 662 incidents, of which 85% involved the presence of other teenagers as passengers. It is well known that young people are highly susceptible to peer influences (Arnett, 2002). Risk-taking is not necessarily the result of overt encouragement by passengers, but can simply reflect social norms, (i.e., perception that certain types of driving behavior are expected in certain types of situations). There is evidence that risk-taking by teens in the presence of other teens, particularly in some situations, is standard behavior (Regan & Mitsopoulos, 2001). In this context, research by Gardner and Steinberg (2005) indicated that in video game playing in a laboratory situation, teens and adults displayed equally risky behavior when playing alone, but in the presence of friends, risk-taking significantly increased among teens but not adults. In regard to driving behavior, in surveys and focus groups, teens confirmed that they are more likely to drive daringly when male passengers are present (Rolls & Ingham, 1992).

On-road behavior corroborates the relationship between teen driving risk and passenger presence. That is, teens are more likely to speed and follow closely when traveling with male passengers, and less likely to do so when with a female passenger (McKenna, Waylen, & Burkes, 1998; Simons-Morton, Lerner, & Singer, 2005; Baxter et al., 1990). In one study, young drivers with young male passengers drove faster and accepted smaller gaps at intersections than

drivers without passengers, while males with female passengers drove slower and did not follow as closely as did males driving alone (McKenna et al., 1998). In a more recent study, teenage drivers leaving high schools engaged in more risky driving than general traffic, particularly when male teen passengers were present. For example, the presence of a male teenage passenger resulted in closer following distance, relative to no passenger or a female passenger, whereas the presence of a female passenger resulted in longer headways for both male and female teenage drivers. In addition, male drivers drove much faster when transporting a male teenage passenger (Simons-Morton et al., 2005).

Evidence for in-car behavior leading to serious crashes involving multiple teen occupants also is available from police reports. In a study by Williams, Preusser, et al. (1998), copies of police reports of fatal crashes involving 16-year-olds were obtained. These reports included cases ranging from distraction (e.g., turning around to talk to someone in the rear seat) to various types of risk-taking induced by passengers (e.g., trying to get the driver to overtake another vehicle), and cases of extreme risk-taking (e.g., passenger grabbing the steering wheel or the driver; speeding without headlights; speeding through a series of stop signs). These actions are presumably rare, but they illustrate what can happen in vehicles containing multiple teens.

Reducing the Problem

There are basically three ways to reduce the problems stemming from teens traveling with teens: try to teach teens to deal with travel situations they recognize as dangerous or potentially dangerous (e.g., “Speak Out!” campaign), convince parents to control passenger travel (e.g., Checkpoints Program), or place restrictions on this kind of travel (i.e., passenger restrictions as a component of GDL).

Programs for Teens

A program developed in Norway, the “Speak Out!” campaign, attempted to influence passengers to take an active role in influencing drivers to drive safely, basically encouraging passengers to intervene if they are in a vehicle being driven in a risky manner. Surveys of teenagers indicated that many viewed the program positively (Ljones, 2000), and an evaluation indicated that it was associated with a 30% decrease in passenger injuries and deaths, although driver injuries and deaths remained unchanged (Elvik, 2000). This is a positive result, although surveys of teenagers generally indicate that many say they would be reluctant to challenge the driver because of embarrassment or concern about annoying them (Ulleberg, 2005; Allstate Foundation, 2005; Regan & Mitsopoulos, 2001), and it is unclear whether those who say they would attempt to intervene would actually do so when in the situation.

There also has been an investigation of the feasibility of applying the principles of Crew Resource Management to the driving situation (Mitsopoulos et al., 2005). Crew Resource Management was originally developed in the aviation domain, as a way to enhance communication and teamwork in dealing with emergency situations in the cockpit. Recommendations for a training program applicable to the driving situation have been advanced, but this has not yet been implemented (Regan et al., 2005).

Teenagers can also be educated in an attempt to influence them to control who they travel with. A media campaign in Victoria, Australia (If you Don't Trust the Driver, Don't Get In,") was conducted, trying to make young people aware that they have a choice about whether to travel with drivers they deem to be irresponsible (Transport Accident Commission, 1997). There has been no formal evaluation of this program. Surveys have indicated that many teenagers do not view traveling with their friends as particularly risky, which may dampen the effects of such programs (Rhodes et al., 2005).

Programs for Parents

Parents can be urged to monitor and control the travel patterns of their sons and daughters, in terms of who their teens transport, and who they ride with as passengers, taking into account scenarios that are known to be especially risky. Unfortunately, many parents exert little control over travel with other teens (Beck et al., 2001; Hartos et al., 2000). In the absence of legal restrictions, teens report that their parents showed little concern about their traveling with or transporting their friends. Programs for parents have had some limited success in modifying this behavior, but indicate that many parents do not follow the recommended guidelines (Simons-Morton et al., in press). Surveys have indicated that parents in general are more concerned about travel late at night, or travel in bad weather, than they are about travel with friends in the car (Williams et al., in press).

Passenger Restrictions

The other technique for controlling passenger travel is to restrict it by law. New Zealand was the first jurisdiction to do so when they introduced a graduated licensing system in 1987. The New Zealand system included both night and passenger restrictions. The nighttime provision restricted unsupervised driving from 10 p.m. to 5 a.m., and the passenger restriction prohibited the carrying of passengers younger than age 20, unless an adult was present. Both provisions were found to be effective in reducing crashes, especially the night restriction, and the night restriction was more popular with teens and parents (Begg & Stephenson, 2003). Some teens objected to the passenger restriction because of the inconvenience of not being able to transport friends (Begg & Stephenson, 2003). Correspondingly, there was less reported compliance with the passenger restrictions. In one survey, 33% said they violated the passenger restriction on at least a weekly basis, compared with 17% who said they were weekly violators of the nighttime restriction (Frith & Perkins, 1992). In another survey, 65% of males and 70% of females reported violating the passenger restriction at least sometimes, compared with 52% of males and 45% of females who said they violated the nighttime restriction at least sometimes (Harre, Field, & Kirkwood, 1996).

The graduated licensing revolution began in the United States in 1995, when Florida enacted the first modern graduated system. Florida's law had a night restriction but not a passenger restriction, and that was the case for many of the early graduated driver licensing laws in the United States. Passenger restrictions were a later entry, with California enacting the first meaningful law in 1998. This was a favorable development; nighttime restrictions should affect travel with passengers, but only at night. It is known that the presence of passengers increases crash risk both at night and during the day (Chen et al., 2000; Doherty, Andrey, & McGregor,

1998), and the bulk of passenger deaths occur outside of nighttime hours (Williams & Ferguson, 2002). With California acting as a trend setter, most subsequent graduated driver licensing (GDL) legislation included passenger restrictions, and some of the earlier States amended their legislation. As of January 2007, 45 States and the District of Columbia have nighttime restrictions, and 37 States plus the District of Columbia have passenger restrictions (IIHS, 2007).

There is substantial variation in passenger restrictions, especially in terms of how many passengers they allow and how long they last (Insurance Institute for Highway Safety, 2006). The risk of having even one young passenger in the vehicle is well established, but the restrictions allow anywhere from none to up to three. For the time period immediately after licensure: 15 States allow no passengers; 16 allow one; 2 States allow two passengers; and 2 States allow three passengers. Some States restrict all passengers, some only those of a certain age, usually younger than 20. Some relax the restriction over time (e.g., Colorado allows no passengers for the first 6 months, then one for the following 6 months). Many of the laws exempt family members, although there is no evidence as to whether family members are different from non-family members in terms of crash risk. This exemption is more a matter of convenience for families. Also, none of the restrictions takes into account the information that some young driver/young passenger combinations (e.g., male driver/male passenger) are especially high-risk, and some (e.g., female driver/female passenger) are lower risk.

In several States, night driving restrictions have existed since the 1960s and 1970s, and their effectiveness in reducing crashes has long been established (Williams & Preusser, 1997). Moreover, their early introduction in graduated driver licensing systems in the 1990s allowed further study of their effectiveness, reaffirming earlier findings (McKnight & Peck, 2001). In contrast, passenger restrictions did not begin to appear until the late 1990s, so less is known about their effects.

We do know that, as in New Zealand, there are less favorable attitudes about passenger restrictions than nighttime restrictions, especially among teenagers, and reported compliance is lower. Parents support passenger restrictions but not to the extent that they support nighttime restrictions. In a 1995 national survey of parents, 74% supported a nighttime restriction compared with 43% who were in favor of a passenger restriction (Ferguson & Williams, 1996). In four States in which parents of graduating seniors were interviewed, favorability toward passenger restrictions ranged between 54% and 72%, compared with a range of 75-94% in favor of nighttime restrictions (Williams et al., 1998). In Connecticut and Florida, where the same parents were interviewed before and after their teenagers were licensed, support for a passenger restriction increased from 56% to 69% in Florida, and from 58% to 72% in Connecticut, even though neither State had a passenger restriction (Ferguson et al., 2001).

In a study in California of parent and teen accommodation to the graduated driver licensing law, young people and their parents, before and after the law, were interviewed multiple times (Williams, Nelson, & Leaf, 2002). More than 80% of parents approved of the passenger restriction, though this was less than the 90%+ who were in favor of the nighttime restriction. About two-thirds of teens were in favor of the nighttime restriction, which began at midnight. Only about one-third approved of the passenger restriction, which allowed no

passengers younger than age 20 for the first 6 months of licensure unless an adult age 25 or older was in the vehicle.

Both teens and their parents in California reported that travel with young passengers decreased subsequent to the law. For example, according to the teens, the median number of times teens transported young passengers unsupervised in the first 6 months of licensure prior to the law was 59, compared with 15 after the law. Parental responses indicated that before the law, 14% said they did not allow transportation of young passengers the first 6 months of licensure, compared with 50% once the law went into effect. Thus, transportation of passengers reportedly decreased, although there was considerable non-compliance, more than in the case of the nighttime restriction.

California teenagers said the passenger restriction impacted their social activities, but most (89%) said they could find ways to do their activities anyway, and 74% said the restriction did not affect them very much. The majority of parents said there was no inconvenience caused by the passenger and nighttime restrictions; only 8% said there was inconvenience that was frequent or major.

The decrease in transporting young passengers reported by California teens and their parents would be expected to lead to reductions in crashes and injuries. However, limited compliance with passenger restrictions is an important issue that will inhibit effects. In order to foster greater compliance, more needs to be known about how parents and teens view the risks of passenger travel, their own enforcement practices in regard to passenger restrictions, and the role police play or are perceived to play in enforcement. The concern is that the lack of recognition or acknowledgment about the risk of passenger travel, and the liberal allowance of such travel reported by parents in pre-law surveys, may lead to low compliance with passenger restrictions. This may particularly be the case if police enforcement is minimal. Accordingly, as part of the present study, we conducted a series of focus groups with teens, parents, and police to explore these and other issues.

Effects of the Restrictions on Crashes

Compliance with passenger restrictions is not the only factor that will affect their effects on crashes. Another issue is that teens can comply with the restrictions in ways that reduce but also involve crash risk (e.g., a teen driver/teen passenger combination becomes instead two teen drivers). For travel with passengers that has been made illegal, there are several possible choices: don't change, and violate the law; become drivers themselves; travel with an older driver; or forgo the trip. The crash risk for each of these types of travel is known, and the theoretical change in crash involvement has been calculated under various compliance scenarios (Chen et al., 2001). Under a high-compliance scenario, substantial crash reductions would be achieved, and there would be reductions in crashes even under low-compliance scenarios (e.g., 10% continue to travel with young drivers, 10% go with older drivers, 10% drive themselves). There is such a major increase in crash risk when young drivers transport young passengers that even if all passengers ages 16-19 were to comply by driving themselves, an estimated 290 yearly fatalities would be prevented in the United States (Chen et al., 2001).

These theoretical calculations were made before it was possible to study the real-life effects of passenger restrictions on crashes. Now enough time has elapsed since passage of the laws that such studies can be undertaken. Presently, there is some limited evidence of passenger restriction effects, primarily from national studies.

A study of changes in fatal crash involvement across the United States between 1993 and 2003 found that the percentage of 16-year-old fatal crash involvements that involved unsupervised transportation of teenage passengers dropped from 53% to 44%, with the reductions occurring primarily in jurisdictions with nighttime and/or passenger restrictions targeting these crashes (Williams, Ferguson, & Wells, 2005). In a second national study, implementation of graduated driver licensing programs including night and passenger restrictions were associated with 16-21% reductions in fatal motor vehicle crashes involving 16-year-old drivers (Chen, Baker, & Li, 2006). In a third national study, teen passenger fatalities were found to be substantially reduced by graduated driver licensing programs (Morrisey et al., 2006).

To date, there is only one State, California, that has evaluated passenger restrictions as a component of graduated driver licensing. There have been four studies of the effects of California's graduated licensing program, differing in findings for overall effects, but all indicating positive results for the passenger restriction (Rice et al., 2004; Cooper et al., 2004; Masten & Hagge, 2003; Zwicker et al., 2006). The latest evaluation demonstrated a 38% reduction of 16-year-old drivers in crashes per capita in which teen passengers were injured or killed (Zwicker et al., 2006).

Clearly, we have a lot to learn about the effects of passenger restrictions on crash and injury involvement. The present study evaluated passenger restrictions in three additional States: California (compared with Arizona), Massachusetts (compared with Connecticut), and Virginia (compared with Maryland).

II. CRASH DATA

Method

State selection

Three States were selected for this study. The criteria for inclusion was that each State have a "strong" passenger restriction law (no more than one passenger for a minimum of 6 months) and had ample pre- and post-law change crash data. The States chosen were California, Massachusetts, and Virginia. Both California and Massachusetts went from no passenger restriction to a strong restriction. Virginia went from a relatively weak passenger restriction—which allowed up to three teen passengers with a 16-year-old driver—to a restriction that allowed no more than one teen passenger.

California's GDL provisions went into effect in July 1998. Minimum age to obtain a learner's permit is 15 years and 6 months, and the permit must be held for at least 6 months, making 16 the minimum age for licensing. Fifty hours of supervised driving (with 10 at night) are required prior to licensure. Newly licensed drivers are restricted from driving with passengers younger than 20 unless supervised by a driver older than 24. This restriction lasts for 6 months or until the driver is 17. Recently, California has extended this restriction to last for a full year, but this law change is not included in our range of data. In addition to the passenger restriction, drivers younger than 16 years and 6 months were restricted from driving between the hours of midnight and 5 a.m.

Massachusetts's GDL went into effect on November 4, 1998. In Massachusetts, a driver must be at least 16 to get a learner's permit. The permit must be held for at least 6 months, making the minimum licensing age 16 years and 6 months. There is a required 12 hours of supervised driving prior to licensure. For the first 6 months of driving the driver is restricted from having passengers younger than 18 unless supervised by a 21-year-old or older driver. There is also a restriction on driving between the hours of midnight and 5 a.m.

Virginia changed their passenger restriction law on July 1, 2001. Virginia drivers can apply for a learner's permit at the age of 15 years and 6 months and have the permit for 9 months; licensure can occur at 16 years and 3 months. Prior to licensure, drivers must have had 40 hours of supervised driving (10 hours of which occurred at night). Drivers are allowed no more than one passenger younger than 18 during their first 12 months of licensure. Drivers are also banned from driving between midnight and 4 a.m.

Each State was paired with a comparison State that had no change in their passenger restriction for the years used in the analyses. Hierarchical Cluster Analysis, using fatalities per 100 million vehicle miles traveled, per capita income, population per square mile, and percentage of the population living in an urban setting was used to find comparable States. When multiple States matched equally well, the geographically closest State was chosen. The chosen comparison States included Arizona for California; Connecticut for Massachusetts; and Maryland for Virginia.

Arizona's licensing regulations allow learners permit at age 15 years and 7 months. A driver must hold the permit for at least 5 months. Full licensure is allowed at age 16. Connecticut's law, for most of the time period covered by this study, allowed a learner's permit to be obtained at age 16 with a minimum holding period of 6 months (4 months with driver's education). Minimum entry age to full licensure was 16 years and 4 months. Drivers must take driver's education or have been home taught by a qualified home-schooling plan. For the last 3 months in 2003, Connecticut added a passenger restriction (no passengers for 3 months). Since 2005, Connecticut has added a longer passenger restriction and a nighttime driving restriction. Maryland, for the time periods included in this study, allowed a learner's permit at age 15 years and 9 months (with a mandatory holding period of 4 months). Forty hours of supervised driving was required. There was also a night driving restriction and full licensure (without restriction) at age 17 years 7 months. In 2005, Maryland modified its restrictions. The holding period for a permit increased to 6 months. Supervised driving increased to 60 hours (10 of which must be at night). A 5-month passenger restriction was added and the minimum full licensure age increased to 17 years and 9 months.

Dependent Measures/ Data

GDL laws primarily affect 16-year-old drivers, followed by 15-year-old drivers and 17-year-old drivers. The dependent measures, each examined in separate analyses were:

- Sixteen-year-old driver crash involvements per 1,000 population
- Fifteen- to 17-year-old driver crash involvements per 1,000 population
- Highway injury/death of 16-year-olds whether as drivers, passengers, or non-occupants per 1,000 population
- Highway injury/death of 15- to 17-year-olds per 1,000 population

We hypothesized that these dependent measures would be significantly reduced, given the strong GDL laws. If this hypothesis is confirmed, looking at a change in the ages of passengers in the crashes could identify whether the passenger restriction component was an integral part of the effect. This is important because there are usually other components (e.g., nighttime driving restrictions) introduced simultaneously. Thus, we also looked at a subset of crashes where 16-year-old drivers were driving with teen passengers.

Note that 15- and 17-year-olds were not examined separately. There are generally few 15-year-olds involved in crashes. For 17-year-olds it is difficult to know whether or not they are covered by the restriction (e.g., some restrictions may expire after 6 months). The importance in including these groups, however, is so that we can examine the impact of the passenger restriction on young drivers in general.

We utilized a control or comparison series of driver crash involvements per 1,000 population for drivers ages 35 to 49. For the second two dependent measures, the control or comparison series was highway injury/death among 35- to 49-year-olds whether as drivers, passengers, or nonoccupants.

Several studies (e.g., Preusser, 1995) have indicated that positive effects of GDL components for 16-year-old drivers may be partially offset by negative effects in later years. For

instance, we know that the first few months of driving can be extremely dangerous. If GDL delays these first few months of driving until age 18 then these older drivers may show higher crash rates after GDL has been implemented as compared to the same-aged drivers before GDL. Therefore, the following dependent measures will also be included in order to provide a complete and thorough examination of the passenger restriction:

- Eighteen- to 19-year-old driver crash involvements per 1,000 population
- Highway injury/death of 18- to 19-year-olds per 1,000 population

We hypothesized that the passenger restriction will not be related to any increase in crash rates for 18- and 19-year-old drivers. Nevertheless, these were calculated and included in the final estimate of the value of the passenger restriction.

We also included 20- to 34-year-olds in Massachusetts and California to include the full range of drivers from 15 to 49. These data became difficult to collect from the comparison State for Virginia and so we did not conduct this analysis for Virginia.

Population data were taken from U.S. Census Bureau annual estimates of population by age for each State. The population was assumed to change linearly across month from year to year. Thus, monthly population estimates were computed from the annual estimates assuming a linear change in population.

Analyses

Time series analyses were used to show changes in crash rates coincidental to the onset of the passenger restriction law. Through a multivariate interrupted time series design, the ARIMA (Autoregressive Integrated Moving Average) can determine if there is a change in number of crash involvements starting at the change of the law. Within time series oftentimes, there is random noise which makes it difficult to determine any changes to the series. ARIMA modeling helps control for this by requiring the selection of a model that controls for periodic fluctuations in the data series. That is, a combination of parameters is entered into the analysis such that systematic fluctuations in the data (i.e., monthly "lags") are reduced to non-significance. Lags are numbered based on how many months it takes for a pattern to repeat. That is, a 12-month lag would indicate that there is some systematic change in the series that repeats annually. Lags are judged to be non-significant (or stationary) based on exploration of Autocorrelations (AC) and Partial-autocorrelations (PAC) where the monthly lags are deemed to be random with 95% confidence. Lags may also be deemed "stationary" based on the Box-Ljung Statistic. Specifically, most lags are considered stationary if they are not significant on *either* the Autocorrelations (AC and PAC) or the Box-Ljung. Lags at 1 and 12 months are held to a higher standard as they are "expected" lags. For these lags to be considered stationary there must be no significance for both measures. The parameters used to control the lags must significantly affect the series in order to be considered valid for inclusion in the model (e.g., see Table 1). We conducted the analyses using the "Trends" module of the software package SPSS 11.5.

The ARIMA modeling process in this study applied parameters to account for periodic fluctuations in crash rates. For instance, when a passenger restriction law is introduced, we expect crash rates for affected parties to decrease. As mentioned earlier, there is the possibility of

non-periodic fluctuations that might occur due to random noise or simply different numbers of weekend days in a given month. The modeling process accounts for these periodic variations in the series by including the appropriate parameter. The simplest models that created a stable or "stationary" series were used. Data results are reported with two groupings of three digits (e.g., [100] [001]). In each grouping of digits the first digit represents the "autoregressive" (AR) parameter; the second digit describes the "differencing" parameter; and the third digit is the "moving average" (MA) parameter. The first grouping is monthly parameters and the second grouping is seasonal parameters. Thus in the example above (100) (001) there is a single monthly autoregressive parameter, no differencing and a seasonal moving average. Different series may require different parameters to achieve stationarity. A significant effect of the intervention (i.e., the law change) signifies that there was a change in the series coinciding with the intervention.

Each State and its comparison State provided crash data for the study. The data included injury crashes (including fatal injuries) in passenger vehicles. The data were analyzed using the time series analyses on monthly crash data (per 1,000 population). Each target State's comparison State's crash data was used as a covariate. This method allowed the analyses to better control for cohort effects, economic changes and other external variables that may account for a change in crash rates at the time of the law change. The exact same series were created for each State and their comparison State unless otherwise noted. That is, if the series of data being analyzed were monthly crashes for 16-year-old drivers per 1,000 population, then that same series from the comparison State (monthly crashes for 16-year-old drivers per 1,000 population) was used as the covariate. Adding the covariate to the ARIMA analyses accounts for any changes in monthly crash involvements accounting for any change in the comparison State. If there is a general upward trend in the comparison State, it will make a downward trend in the target State appear that much more apparent. Conversely, if a downward trend exists in the comparison State starting at an intervention time for the target State, then for a similar downward change in the target State to be statistically significant it will have to be a change of a greater magnitude than that of the comparison State. All intervention points were set at the law change date.

The results for the analyses are displayed in the ARIMA tables (in the text or in Appendix A). These tables (e.g., Table 1) display the parameters used to create a stable series as well as their significance levels. The tables also display whether the law change was significant or not. The "estimates" for law change represents the average change in involvements per month per 1,000 population (i.e, the size of the effect).

Results

California

We ran ARIMA time series analyses on several series of varying makeup with a comparable series from Arizona used as a covariate. We used the years 1995 through 2003 for the analyses with the intervention date set to July 1998.

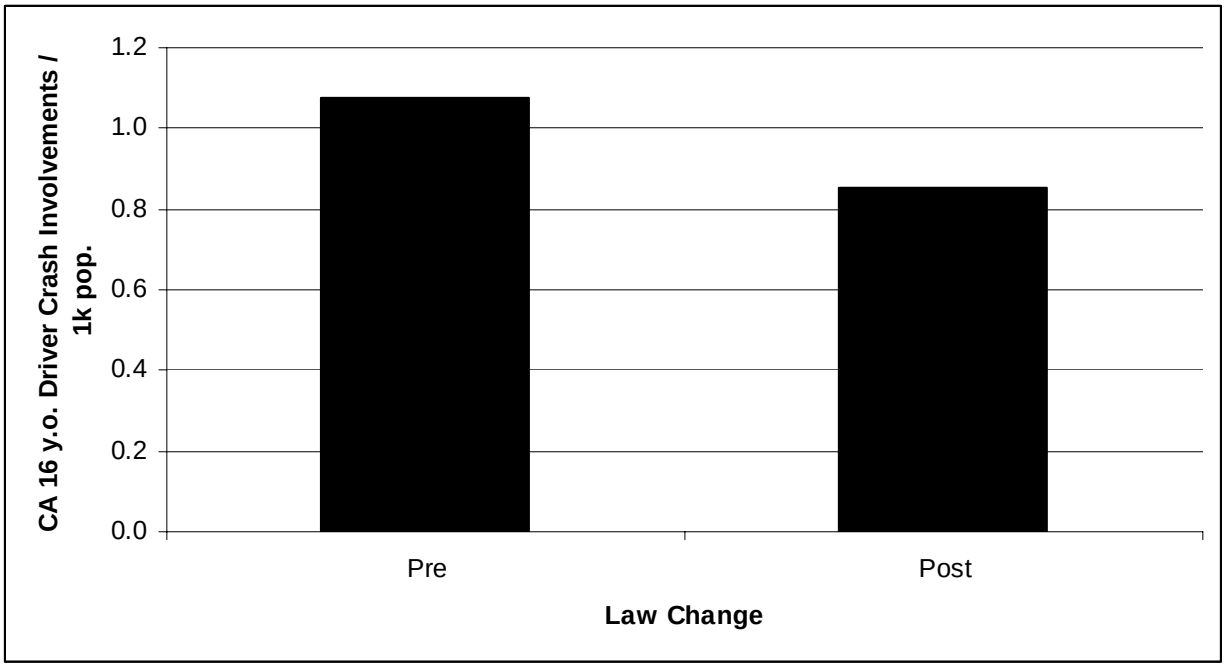
Sixteen-year-old driver crash involvements

The ARIMA model (100) (100) adequately stabilized the data series. The results show that there was a significant decrease in the number of 16-year-old drivers involved in injury crashes coincident to the law change (Table 1). There was an estimated savings of .127 crash involvements per 1,000 16-year-olds in the State per month. This result indicates that on average there were 740 fewer 16-year-old drivers involved in crashes per year as a result of the passenger restriction. Over the timeframe of the study there was an estimated 13% fewer crashes. Figure 1 shows the average number of 16-year-old drivers involved in crashes before and after the law change.

Table 1. California 16-Year-Old Driver ARIMA

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.808	.058	13.907	.000
Seasonal Lags	Seasonal AR1	.352	.093	3.774	.000
Regression Coefficients	Law Change	-.127	.059	-2.152	.034
	AZ Covariate	.068	.024	2.847	.005
Constant		.861	.083	10.361	.000

Figure 1. California 16-year-old drivers in crashes pre/post law change



Fifteen- to 17-year-old driver crash involvements

The ARIMA model (100)(100) demonstrates that the decrease in these crash involvements was not significant. Thus, the effect of 16-year-old drivers described above was not present when 15- and 17-year-old driver crash involvements were added to the series. Appendix A contains the ARIMA tables for all California analyses.

Eighteen- to 19-year-old driver crash involvements

It was predicted that 18- and 19-year-old drivers would not be affected by the law change. The results of the ARIMA (100) (100) produced a non-significant effect for law change.

Thirty-five- to 49-year-old driver crash involvements

There was also no predicted change in the 35- to 49-year-old driver crash involvements. A change in this series might indicate a general shift in crash rates across the region. Consistent with the expectation that the effects are due to the law change in question, there was no change in crashes among this age group. That is, the ARIMA model (101) (100) did not show a significant effect of change.

Motor vehicle injuries

Not only were 16-year-old drivers less involved in crashes but there were also fewer 16-year-olds injured in motor vehicle crashes. Again the model (100) (100) showed that there was a significant decrease in these injuries. Specifically there were .13 fewer 16-year-olds injured per 1,000 16-year-olds in the State. For the analysis, combining injured 16-year-olds with 15- and 17-year-olds, stationarity could not be achieved using a simple model. The model (101) (101) with an additional autoregressive parameter at lag 16 demonstrated a significant decrease of .14 injuries for these ages per 1,000 population. This parameter—indicating a periodic fluctuation every 16 months—cannot be easily explained. The analysis indicates a significant decrease in injuries among this age group. However, given the "odd" parameter, a very conservative conclusion might be that there was no increase in 15- to 17-year-old motor-vehicle-related injuries. Using the estimate from this analysis there were on average 2,433 fewer motor vehicle-related injuries among 15- to 17-year-olds in the State.

An analysis of 18- and 19-year-olds demonstrates that there was no shift in crash involvements from the younger group to the older groups. The model (100) (100) showed that there was not a significant increase in 18- and 19-year-old driver crash involvements following the law change. Lastly, there was no change according to the ARIMA model (101) (100) for injured persons ages 35 to 49, indicating no significant change in injuries across the region during the same time frame as the passenger restriction implementation.

Sixteen-year-old drivers with passengers

There is also some evidence that the crash involvement and injury reduction can be attributed, in part, to the passenger restriction component of the law. An examination of teens driving with passengers under 20 shows a near significant effect of the law-change using model (100) (100). That is, there was a reduction in crash involvements by 16-year-old drivers with young passengers (see Table 2). There were an estimated .06 fewer of these involvements per 1,000 16-year-olds in the State.

Table 2. Sixteen-Year-Old Drivers with Teen Passengers.

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.907	.046	19.628	.000
	MA1	.355	.112	3.171	.002
Regression Coefficients	Law Change	-.063	.032	-1.967	.052
	AZ Covariate	.047	.019	2.479	.015
Constant		.254	.039	6.520	.000

Massachusetts

In Massachusetts, we used the years 1995 to 2003 for the analyses. Connecticut was chosen as the comparison State but because southern Connecticut is very different from the rest of Connecticut (e.g., parts are suburbs of New York City), and less similar to Massachusetts, we used only the four (of eight) counties in Connecticut that were contiguous to Massachusetts[1]. Intervention was set at December 1998—the date the new law went into effect.

Sixteen-year-old driver crash involvements

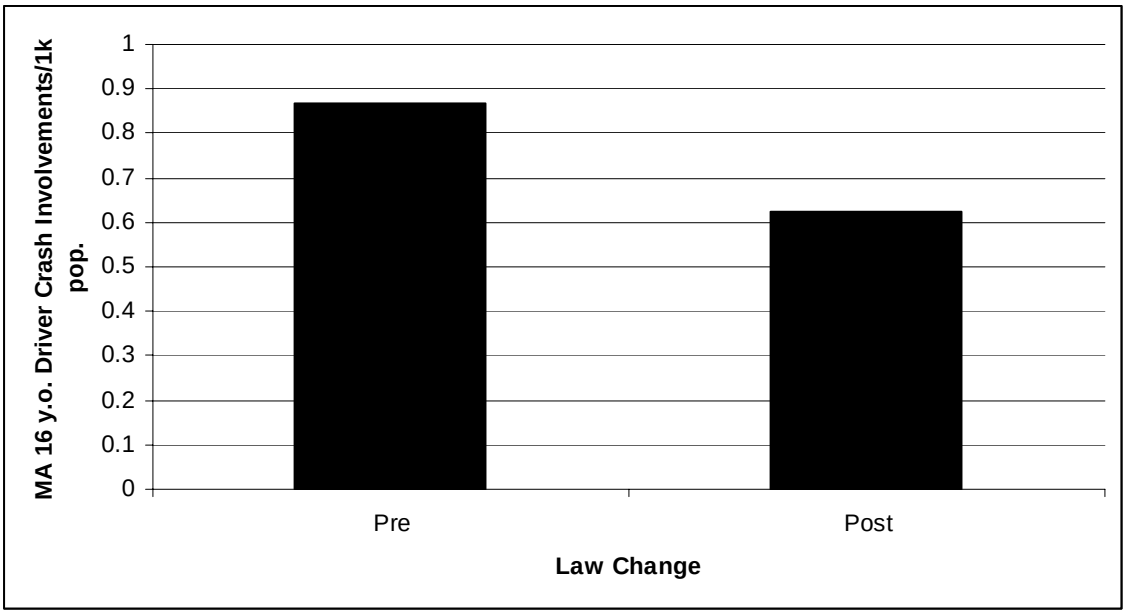
The data series using 16-year-old drivers involved in injury crashes was analyzed with the ARIMA model (100) (000). The results demonstrated a significant decrease in crash involvements. Specifically, there were an estimated .16 fewer crash involvements per 1,000 16-year-olds per month (Table 3). Accordingly, there was an average of 173 fewer 16-year-old driver crash involvements per year. From the law change until December 2003 there was an estimated 21% reduction in 16-year-old driver crash involvements. Figure 2 indicates the average number of involvements (per 1,000 population) before and after the law change.

Table 3. Sixteen-Year-Old Driver Crash Involvements in Massachusetts

		Estimates	Std Error	T	Approx Sig
Non-Seasonal Lags	AR1	.269	.109	2.469	.016
Regression Coefficients	CT Covariate	.083	.068	1.227	.224
	Law Change	-.160	.041	-3.954	.000
Constant		.794	.064	12.390	.000

[1] Note that Connecticut had a law change in 1997 that changed the number of 16-year-old drivers entering their system. When the covariate was removed (for analyses including 16-year-olds) the results did not change in terms of significance.

Figure 2. Massachusetts 16-year-old drivers in crashes pre/post law change



Fifteen- to 17-year-old driver crash involvements

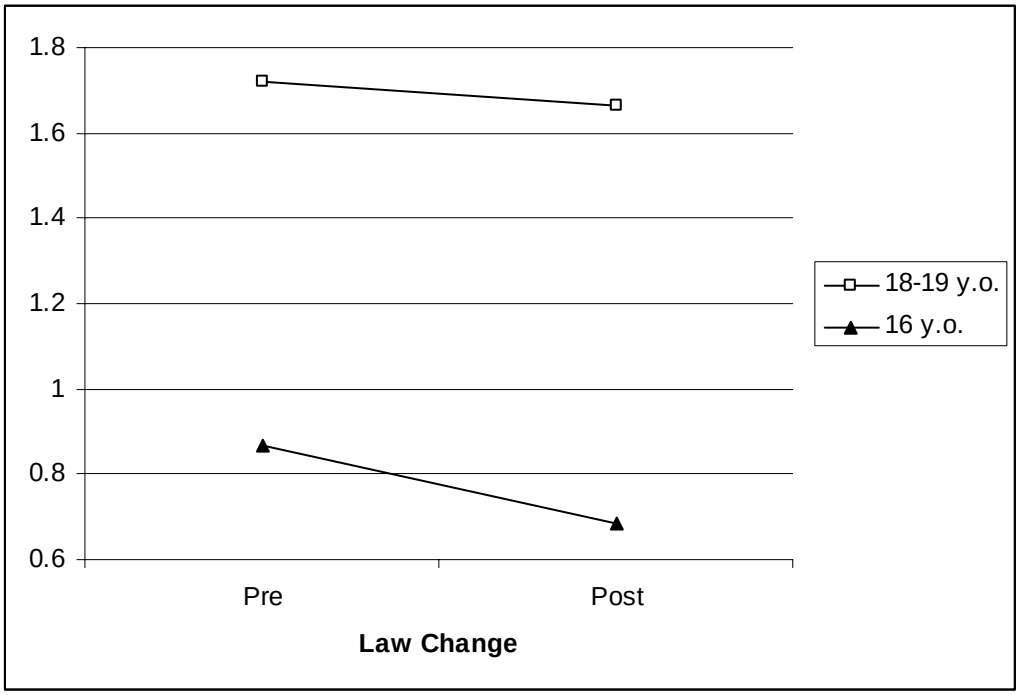
Similar effects to the 16-year-old drivers were shown combining 15-, 16-, and 17-year-old drivers involved in injury crashes. The model (100) (100) resulted in a significant effect of law change. There were an estimated .125 fewer crash involvements in this age group per 1,000 people of this age per month.

Eighteen- to 19-year-old driver crash involvements

Analysis on a series containing 18- to 19-year-old drivers involved in injury crashes demonstrated an unexpected effect of the law. Specifically there was a decrease in involvements for this age group starting at the law change. Given that this age group should not have been affected by the law change, it is reasonable to question whether the decrease in the crash involvements for younger drivers in Massachusetts reported above were due to an uncontrolled confounding factor that also affected 18- and 19-year-old drivers, or whether the decrease can be attributed to the law change.

To explore these possibilities an analysis of variance (ANOVA) was conducted to see if the rate of decrease was greater for the 16-year-old drivers than the 18- and 19-year-old drivers. The rationale is that if the 16-year-old drivers have a significantly greater decrease in crash involvements than the older group, then the greater effect could have been due to the law change. Indeed a 2 (pre/post law change) by 2 (16-year-old drivers, 18- to 19-year-old drivers) ANOVA demonstrated, in addition to the main effect for age (older drivers crash more than younger drivers) and the main effect of law change (fewer crashes after the change), a two-way interaction. The interaction is driven by the fact that the downward slope for the 16-year-old drivers is greater than for the 18- to 19-year-old drivers (See Figure 3). Thus, the evidence suggests that the passenger restriction was influential in decreasing crash involvements for the 16-year-old drivers.

Figure 3. Mean of monthly driver crash involvement



Thirty-five- to 49-year-old driver crash involvements

The analyses of 35- to 49-year-old drivers showed a non-significant effect. The ARIMA model (100) (100) suggests that there was no change in the crash rate of this age group starting at the law change.

Motor Vehicle Injuries

For the series involving non-drivers and age there was no covariate used, as age information was not available for non-drivers in the Connecticut data. The results of the ARIMA indicate a decrease in injuries and fatalities among 16-year-olds (whether they were drivers, passengers, or nonoccupants). The ARIMA (100) (100) on this series produced a significant effect of law change. The same model was also used to show a significant decrease in the number of motor vehicle injuries among 15- to 17-year-olds. The estimated reduction in average annual injuries to this age group was 1,122. There was no effect for the 35- to 49-year-olds.

Sixteen-year-old drivers with passengers

Because of the structure of the Massachusetts database it was not possible to indicate which vehicle a given passenger was occupying. For example, if there was a two-vehicle crash with one vehicle being driven by a 16-year-old and the other by a 30-year-old, we would know that there was a 15-year-old passenger but would be unable to identify which vehicle this passenger occupied. Thus, we conducted two analyses. The first analysis was limited to two-vehicle crashes to increase the likelihood that a given passenger was in the teen driver's vehicle. It is unlikely that the number of passengers in vehicles driven by non-teens would go down following law change. Therefore, a decrease in the number of 16-year-old driver-involved crashes with passengers under the age of 20 present would likely be due to a decrease in the

number of 16-year-olds driving with teen passengers. To be sure, a second analysis was conducted examining single-vehicle crashes where there was a teen passenger present in a 16-year-old driver's vehicle. For this series, it is known that the passenger was in the 16-year-old's car.

Both analyses produced significant effects. There were fewer 16-year-old drivers involved in two-vehicle crashes where there was a teenaged passenger without another passenger older than 25 after the law changed (Table 4). The ARIMA model (100) (000) showed a significant decrease in the number of drivers. There was an estimated .16 fewer monthly drivers involved per 1,000 population. The same passenger makeup but with single-vehicle crashes only also showed a significant decrease using the model (000) (100) (Table 5). The estimated reduction for this series was .13 fewer involved drivers per month per 1,000 population. Thus, there appears to be a reduction in crashes involving 16-year-old drivers with "illegal" passengers.

Table 4. Sixteen-Year-Old Drivers in Two-Vehicle Crashes with Passengers

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.314	.107	2.945	.004
Regression Coefficients	Law Change	-.089	.018	-5.076	.000
Constant		.208	.012	17.987	.000

Table 5. Sixteen-Year-Old Drivers in Single-Vehicle Crashes with Passengers

		Estimates	Std Error	t	Approx Sig
Seasonal Lags	Seasonal AR1	.230	.113	2.039	.045
Regression Coefficients	Law Change	-.045	.008	-5.562	.000
Constant		.089	.006	16.061	.000

Virginia

ARIMA time series analyses were run on several series of varying makeup with a comparable series from Maryland used as a covariate. The years 1999 through 2003 were used for the analyses with the intervention date set to July 2001.

Sixteen-year-old driver crash involvements

The ARIMA model (001) (000) shows that there was a significant decrease in the number of 16-year-old drivers involved in injury crashes coincident to the law change (Table 6). There was an estimated savings of .381 crash involvements per 1,000 16-year-olds in the State per month. This result indicates that on average there were 454 fewer 16-year-old driver crash involvements per year. According to these estimates, there was a 27% decrease in 16-year-old driver crash involvements from law change until December 2003. Figure 4 shows the average number of 16-year-olds involved in crashes per 1,000 population before and after the law change.

Table 6. Sixteen-Year-Old Driver Crash Involvements in Virginia

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	MA1	-.626	.106	-5.905	.000
Regression Coefficients	Law Change	-.381	.079	-4.841	.000
	MD Covariate	.424	.131	3.228	.002
Constant		1.003	.138	7.271	.000

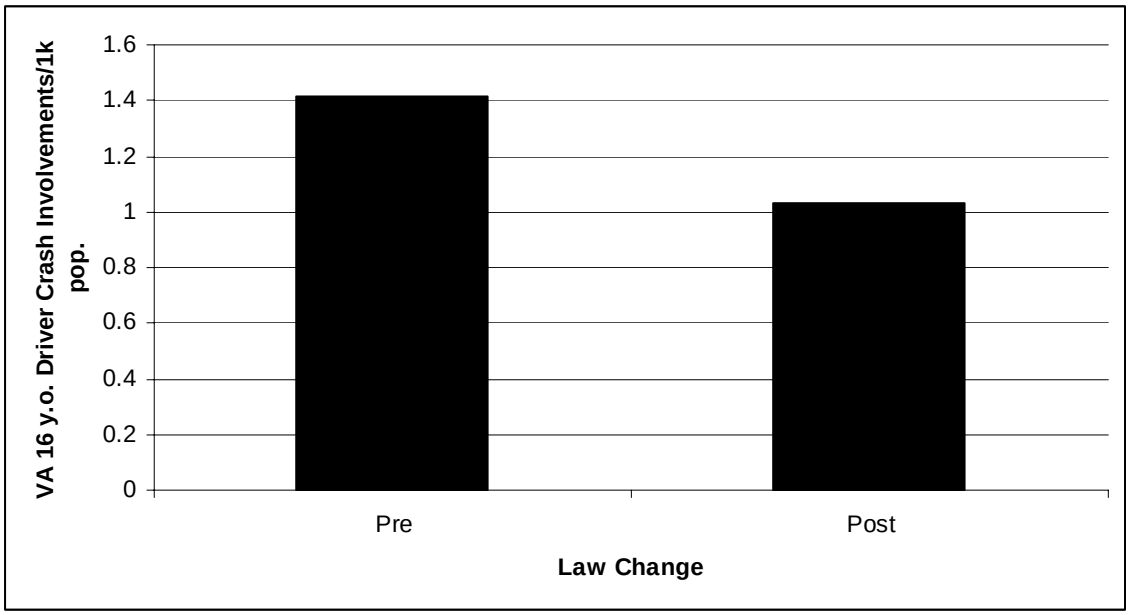
Fifteen- to 17-year-old driver crash involvements

For drivers ages 15 to 17 there was also a law change effect. The ARIMA model (100) (000) produced a stable series that showed a significant effect of the law change. Specifically, there was an estimated .182 fewer crash involvements per 1,000 15- to 17-year-olds in the State.

Eighteen- to 19-year-old driver crash involvements

An exploration of 18- and 19-year-old drivers demonstrates that there was no change in crash involvements. The model (001) (100) showed that there was not a significant increase in 18- and 19-year-old driver crash involvements following the law change.

Figure 4. Virginia 16-year-old drivers in crashes pre/post law change



Thirty-five- to 49-year-old driver crash involvements

An analysis on 35- to 49-year-old driver crash involvements showed no effect of the law using ARIMA model (001) (100). Thus, there was no change in crash rates for these drivers coincidental to the law change.

Motor Vehicle Injuries

As with other States, there were overall fewer 16-year-olds injured in motor vehicle crashes. The model (001) (100) produced a significant decrease in these injuries. There were .438 fewer 16-year-olds injured per 1,000 16-year-olds in the State. Also, there was a law change effect for 15-, 16-, and 17-year-olds combined. The model (000) (000) demonstrated that there were an estimated .211 fewer injuries for these ages per 1,000 population. This estimate resulted in an average annual decrease of 759 injuries among 15- to 17-year-olds. There was no effect for the drivers ages 35 to 49, nor did injuries from vehicle crashes change for this group as indicated by the ARIMA model (000) (000).

Sixteen-year-old drivers with passengers

Exploration of specific passenger configurations within the vehicle suggest that the crash involvement and injury reduction can be attributed, at least in part, to the passenger restriction component of the law. An examination of teens driving with more than one passenger younger than 18 shows a significant effect of the law change using model (000) (000). There was an estimated .029 fewer drivers per 1,000 16-year-olds in the State per month involved in injury crashes (Table 7).

Table 7. Sixteen-Year-Old Drivers With Teen Passengers in Virginia

		Estimates	Std Error	t	Approx Sig
Regression Coefficients	Law Change	-.029	.009	-3.130	.003
	MD Covariate	.205	.047	4.401	.000
Constant		.027	.020	1.348	.183

III. FOCUS GROUPS

Method

Parent and teen participants were recruited by marketing research companies in each location (Cambridge, Massachusetts; Sherman Oaks, California; and Fairfax, Virginia), and focus groups were held in their facilities. All teens were 16 or 17 years old. All had received their licenses on a date that placed them within their State's period of passenger restriction. Parents needed to have a child that met the same requirements as the teens, but could not be from the same family as a participating teen.

Law enforcement agencies were recruited by PRG with help from NHTSA's regional offices and Governors' Highway Safety Offices. The Watertown Police Department represented Massachusetts. California was represented by members of the Los Angeles Police Department and the California Highway Patrol. The Virginia officers were members of the Fairfax County Police Department. Most of the participating officers were traffic patrol officers in the area where participating parents and teens reside. School resource officers also participated in California and Virginia.

Participants tended to be residents of upscale suburbs of major cities (Boston, Los Angeles, and Washington, DC). The Fairfax, Virginia, interviews included two teens and three parents who resided in nearby Maryland.

Table 8. Focus Group Information

Location	Date	Parents	Teens	Police
Cambridge, MA	May 10, 2006	8	11	4
Sherman Oaks, CA	May 16, 2006	11	11	4
Fairfax, VA	June 1, 2006	9	6	3
Total		28	28	11

Findings

Risk Perceptions

Nearly all of the participants in all groups perceived that the risk of injury is higher for teen drivers than adults. Reasons given for this perception included lack of driving experience; driver distraction; peer pressure; nighttime driving; risky driving (e.g., not wearing seat belts, drinking and driving), lack of hazard recognition, insufficient driver education, and inadequate license testing; inclement weather; and teen passengers.

Lack of Driving Experience

Lack of driving experience was the most frequently mentioned reason for the high crash rates among new teenage drivers. One Massachusetts law enforcement officer stated that:

"The law only requires twelve hours of supervised driving, and that is not enough."

A California Officer mentioned *"not being familiar with the streets"* and *"lack of practice in congested traffic*" as specific kinds of experience new drivers were lacking.

Parents also appeared to be dissatisfied with the general lock of driving experience:

> *"The number of hours of on-road instruction is too low."*

> *"Private driving schools that I can afford do not offer the quantity and quality of driver training that I had as a new driver."*

A Virginia teen's response, *"it is because we are experiencing things for the very first time,"* was typical of teens' responses in all three groups.

Driver Distraction

Another frequently mentioned reason for higher teen crash rates was that teens are more easily distracted, especially when attempting a new task like driving. The sergeant in charge of LAPD's Van Nuys traffic unit said,

> *"In the majority of accidents involving teenagers, there is evidence of the driver not paying attention. Distractions include adjusting the radio, using a cell phone, and talking to passengers."*

The same distractions were mentioned early in the discussion by Watertown, Massachusetts, police and again in all of the parent groups. One California father mentioned cell phones and loud music as sources of distraction. Other parents mentioned *"cell phones, iPods, stereos, and the like."*

Peer Pressure

Peer pressure was frequently mentioned among parents in the focus groups.

> *"There is a great deal of peer pressure and pride at that age."*

> *"…they want to show off to their peers."*

A Virginia father referred to *"the testosterone factor in boys."*

Nighttime Driving

Nighttime driving, the other driving circumstance that is restricted in all three States, was mentioned spontaneously in five groups. The issue did not come up in any of the three law enforcement groups until prompted. Parents in all three States spontaneously mentioned "driving at night" as a particular risk for teens. While Massachusetts and Virginia teens mentioned nighttime driving spontaneously, California teens acknowledged the risk only after being prompted.

Risky Driving, Lack of Hazard Recognition, Insufficient Driver Education, and Inadequate License Testing

Less frequently mentioned were perceptions that teens tend not to wear seat belts and that drinking and driving is common in that age group. Other comments included that teens fail to drive defensively, recognize threats after it is too late to avoid them, and become overconfident after they have been driving a few months. Insufficient driver education, too little on-road training in the permit phase, and low standards for permit and license testing also came up in some of the parent and law enforcement groups.

Inclement Weather

The focus groups mentioned bad weather as a greater risk factor for new teen drivers than for adults. Weather was usually the first circumstance mentioned by parents, teens, and law enforcement officers alike. A Watertown, Massachusetts, officer said:

> *"It is a big risk when a kid gets his instruction in the summer and gets his first taste of snow while driving alone."*

Both parents and teen drivers admitted:

> *"It is more dangerous for teens because they usually have not done it until after they are licensed."*

> *"…not knowing what to do if the car skids on snow or ice."*

> *"They simply did not have experience driving in those conditions and don't know how much space it takes to slow down."*

> *"Teens take corners faster and are not aware of how much less grip there is on wet pavement."*

Teen Passengers

Driving with teen passengers was identified spontaneously as a high-risk driving circumstance for teens in seven of the nine groups. It came up in all of the law enforcement groups. In Massachusetts, a police sergeant said:

> *"Most of the teen driver accidents we see are kids driving around with friends in the car, with no particular place to go."*

A Virginia mother said:

> *"When I have seen really reckless behavior on the road, it is a car full of crazed teenagers."*

Finally, a California parent commented that driving with teen passengers is a major distraction. The issue did not come up spontaneously among parents in Massachusetts and was not mentioned by teens in California.

Police officers in Watertown, Massachusetts, were asked what, in general, could be done to reduce the risks of teen driving. The first response was:

> "*Keep other kids out of the car for the first six months, because they are a major distraction."*

Another suggestion was to require more practice driving with adult supervision. Another officer said that the permitting process is too easy. He complained that:

> "*Now, you can just feed twenties into the testing machine until you pass the written test. There is no waiting period between attempts, as in the past."*

Several groups were asked to react to an assertion made in the media in connection with a AAA study that teens posed a greater risk to other drivers than to themselves. None had seen or heard anything about it, but few doubted that it was true. A Massachusetts mom remarked:

> "*Teens are in their own little worlds, and have no consideration for those around them."*

None of the Massachusetts teens believed the AAA assertion, however, one said:

> "*I don't think I am a menace."*

One of the California teens said:

> "*It is probably true because teens do a lot of drinking and driving and they drive fast."*

The rest disagreed. One boy responded:

> "*There is plenty of drinking and driving among older people, too."*

Parent-Imposed Restrictions

Parents and teens were asked for their opinions about parents restricting circumstances in which their teens are allowed to drive as a strategy to minimize risks when they are newly licensed. Reactions were favorable in all of the parent groups. One mom thought it was a good idea because:

> "*Parents know their own children and have a good sense about the kinds of situations that will cause trouble."*

Another added:

> "*Teens are not fully ready to drive alone when they get their licenses and I do not plan on letting my son drive alone in new circumstances until I have been in the passenger seat and am satisfied that he can handle the situation."*

However, in two of the groups there were fathers who felt that children of driving age should not have parent-imposed rules and restrictions.

> "*Teens need to learn by experiencing things on their own and by suffering the natural consequences of their decisions.*"

> "*Children should be educated to do the right things, not forced.*"

Even many of those who favored parental restrictions commented that it is a difficult task.

> "*It only works to the extent that the child will be honest.*"

> "*It is difficult to impose rules and restrictions on your child when her friends are allowed to do whatever they want to do.*"

Although not as positive toward the idea of parental driving restrictions as the parents were, most teens seemed resigned to accept it. A Massachusetts teen said that his parents had been restricting his activities all of his life and driving restrictions are just a continuation of that. Other comments included:

> "*I don't like it when my parents won't let me drive, but if they say it is not safe, it probably isn't.*"

> "*Parents are in a better position to regulate their children's driving than the government is.*"

A few teens at each location were completely against parental rules and regulations, claiming to be fully competent drivers who didn't need any restrictions.

Of the 28 teen participants, 15 indicated that their parents had been "very involved" in the process of their learning to drive safely. Eleven said their parents were "somewhat involved." Two, both in Los Angeles, indicated that their parents were "not involved at all." Only the Massachusetts parents were asked to rate their involvement in teaching their children to drive safely. All but one of them claimed to have been very involved. He said he was somewhat involved, but his wife had been very involved. Most of the Massachusetts parents admitted to being less involved after the child was licensed than they were in the permit phase.

The State of Virginia appeared to do more to reach out to parents and provide information that would be useful in regulating their children's driving after licensing than the other two States did. All of the Virginia groups mentioned that Virginia licenses are awarded by a County Juvenile Judge. As part of the presentation, the judge talks to the parents about their responsibilities for keeping their children safe until they reach the age of 18. In addition to verbal coaching, parents are encouraged to take home highway safety materials (including a suggested parent-teen driving contract) that are present in the room. Symbolically, the judge hands the license to the parent, rather than the teen.

Some Massachusetts parents recalled having received a card from the Motor Vehicle Registry that contained some helpful hints. One mother has it posted on her refrigerator door as a reminder.

The subject of parental information sources was not addressed directly in California, although it was clear later on that the California DMV does a very thorough job of notifying parents about license restrictions. For example, the police said that restrictions are written on the license and the license has a red stripe on it to indicate that the driver is subject to the passenger restriction and curfew. It also has a blue stripe that stays there until the driver is 21 and exempt from the alcohol restriction. Teens confirmed that the restrictions were printed on the back of the license and several complained that they received a letter from the DMV informing them that the passenger restriction had been extended for an additional 6 months.

All of the law enforcement agencies had school resource officers or public information officers that reached out to teens and their parents promoting traffic safety. Information about the licensing restrictions was part of all presentations given to high school students or their parents.

Most of the families represented in the focus groups had family rules about the circumstances under which the teens were allowed to drive. Although formal counts were not done in the Massachusetts and Virginia parent groups, it was clear that the majority of those groups had some rules. Nine of the 11 California parents raised their hands when asked if they had family rules. When teens were asked the same question, 8 of the 11 Massachusetts teens, 5 of the 11 California teens, and 3 of the 6 teens in the Virginia group raised their hands.

A curfew was the most common rule, mentioned by eight parents or teens. Rules about teen passengers were the second most-mentioned rules—by five people. Other rules mentioned by two or more individuals included no loud music, obeying all traffic laws, no freeways or interstates, and other geographic restrictions. Replacing gas in the car, driving the speed limit, maintaining grades in school, no drugs or alcohol, calling home from destination, no crashes, no cell phone use while driving, and asking permission for each trip were also mentioned.

Parents and teens in each State were asked for their opinions about the concept of formal behavioral contracts between parents and the new teen drivers. Eleven of the 57 families represented in the focus groups had a *written* parent-teen driving contract; 4 in Massachusetts, 5 in California, and 2 in Virginia. Many of the families that had driving contracts had used behavioral contracts previously for other issues.

One of the Virginia fathers said his wife found a contract model on the Internet and thought it would work for them. Among the issues covered in his family's contract were alcohol and drug use, passengers, cell phone use, and loud music. He said that they started doing this when their older son started to drive and continued with the second, the current new driver. He said it was absolutely essential for the older boy, who always had given them problems. It might not have been as necessary for the younger boy, but they decided that it would only be fair if they treated both boys the same.

Graduated Driver Licensing

Although few of the parents were familiar with the term "Graduated Driver Licensing" most were favorable toward the concept when it was explained to them. One Massachusetts mom said that the State did parents a great favor by restricting passengers. She would have done it on her own, but the law saved her the trouble. A California father who was against making family rules was favorable toward license restrictions because they set a baseline for acceptable behavior and make it easier for a parent to explain why a child can't have passengers or drive after midnight. There was general agreement that the curfew is good, but some said that it is meaningless because there is no reason for their children to be out after midnight anyway.

The major criticism among parents was that the restrictions were not enforced. One California father said that only the responsible kids pay any attention to it and the restrictions put an unfair burden on them. One of the LAPD officers, who happened to be a mother, said that as a police officer, she understood the need for the restriction, but as a mother, she thought the passenger restriction was a major inconvenience and an unnecessary restriction for her own daughter.

The term "Graduated Driver Licensing" also was unfamiliar to most of the teens. However, all of them knew that their licenses were restricted. None had anything favorable to say about the restrictions. The teens were reluctant to express their opinions about the general idea of teen driving restrictions, either pros or cons, and detailed probing was reserved until the passenger restrictions were discussed.

The law enforcement officers were generally favorable toward the concept of license restrictions for young drivers. A Virginia officer said that it is a good law, because most of the time when he sees kids doing stupid things, the car is full of other kids. Massachusetts and California officers also agreed that the restrictions are necessary and desirable. One of the LAPD officers said that he could:

> *"…understand how responsible kids might feel the restrictions are unfair, but they need to understand that statistics show that drivers in this age group are more likely to crash and the restrictions save lives. There is no way to write laws that sort out the good drivers from the bad."*

Almost all of the parents and teens knew that there were restrictions on nighttime driving and carrying teen passengers. However, there was confusion in all of the groups as to exactly what the restrictions are. This was true for both parents and teens. One of the Massachusetts teens, for example, thought the passenger restrictions pertained to passengers under 21 (the law reads 18). There also was a controversy about whether family members are exempt from passenger restrictions; they are. However, all knew that the restriction is in effect for the first 6 months after they receive their licenses. All teens indicated that their parents knew about the restrictions. One said his parents received a notice in the mail a few days after he got his license. All participants felt that information from the State is adequate, but none had seen any advertising or publicity about the restrictions.

Although all California teens indicated that they knew the license restrictions, they were not clear on the details. One, for instance, thought the curfew was 11 p.m. (it is midnight). There also was some misinformation about how old a passenger had to be to be legal. One teen said 21 and another said 25 (the correct answer is 20 in California). Some thought the duration of the passenger restriction was 6 months, others 1 year. One explained that he had been stopped for another violation and warned about carrying an illegal passenger. The officer explained that the law changed on January 1, 2006, and the new law applied to all drivers under 18, regardless of what the law was when they got their licenses. He did not get a ticket, though, just a verbal warning. When asked how they found out about the restrictions, one teen noted that they are shown on the license. Several teens who obtained their licenses before the law changed indicated that they had received a letter from the DMV that said their restrictions had been extended.

With one exception, Virginia teens recited the restrictions accurately. However, one of the boys said that the curfew does not apply if you are on your way home, regardless of what time it is. It was difficult to tell if he really believed that or if he was simply "playing" with the group. It was the same boy who said his parents' only rule was to come home before 3 a.m. When members of the group were asked how they learned of the restrictions, one teen noted:

"*They were listed in the Drivers License Manual"*

A few said their parents might not have known about the restrictions if they had not told them. Another said:

"*They were mentioned in the license award ceremony and there were brochures about the restrictions available at the ceremony."*

All the Massachusetts parents professed to know what the two restrictions are. They said that their kids brought the news home from driver education classes or they had heard about it from other parents they knew. None could recall any ads, PSAs, or news articles about the restrictions. Asked whether the State has done an adequate job of communicating the law to parents, the group thought the State effort was adequate because information on the GDL law was included in a brochure that was sent to parents during the licensing process.

All California parents also knew there were restrictions, but some thought that the passenger restriction was for 6 months, some for 1 year. One father explained to the others that the law changed on January 1, 2006. He knew that drivers licensed after June 1, 2005, would need to observe the 1-year restriction. One parent was very surprised to learn that the passenger restriction applied to passengers up to age 20. They knew there were exceptions to the passenger restriction for family members and work exceptions to the curfew, but did not know that they needed to apply to the DMV to get an exception. The topic about how the parents learned about the license restrictions and whether they felt they had sufficient information was not discussed in this group.

All of the Virginia parents had a general understanding of the license restrictions. There was considerable discussion about the exceptions. They thought that the State did an adequate job of informing them about the restrictions. This group claimed to remember the presiding

judge talking about the restrictions as he handed out the licenses. They also received a follow-up postcard that showed the license restrictions a few days after the license ceremony. None of the Virginia parents recalled seeing any advertising or publicity on the GDL law, including the nighttime and passenger restrictions.

Passenger Restrictions

The Massachusetts traffic officers agreed that it was a bad idea for new teen drivers to have other teens as passengers because the passengers are a distraction and the situation encourages risk-taking behavior.

> *"At least the law does something to discourage carrying teen passengers."*

Even though violation of the restriction is primary (an officer may stop a vehicle for the observed violation alone as opposed to "secondary" wherein the vehicle must first be stopped for some other violation) in Massachusetts, the law is very difficult to enforce, even secondarily. There is nothing on the license itself that shows there is a restriction. Upon making a stop, the officer must do the math with the birth date to determine if the driver might be in the age group where a violation is probable, then call in a registry check to determine if the driver has been licensed less than 6 months. It is also difficult to determine the passenger's age, since the officer can't ask the passenger for ID without probable cause.

Virginia officers had favorable attitudes toward the passenger restriction. They believed it was the more important of the two driver license restrictions. One officer said that risky driving behavior that kids engage in when they have passengers leads to excessive teen crashes . When asked for negatives about the law, the Virginia officers said that it is "secondary." Another criticism is that it is too complicated, with too many exemptions. The family member exemption, in particular, causes many problems. One of the officers told of a recent stop where he needed to spend 15 minutes on the phone to verify that passengers who claimed to be family members were not, before writing a citation.

California officers also believe that the passenger restriction is more important than the curfew, and were generally in favor of it. The main benefits given were that it eliminates distractions and cuts down on "mischievous behavior." One of the officers said:

> *"It is not the time of day that causes teens to have accidents. It is the peer pressure and fooling around."*

The only negative was the inconvenience the law causes for teens and parents.

Parents listed the same benefits for the passenger restriction as the law enforcement officers. All of the parent groups felt that passenger restrictions eliminated distractions and reduced peer pressure to engage in intentionally risky driving. Parents also noted that because passenger restrictions was the law, it was easier for parents to impose their own passenger restrictions.

The most frequently noted disadvantage in all of the parent groups was that the passenger restriction laws were not enforced, and their children's friends paid no attention to it. That created an unfair burden on responsible parents and teens who wanted to obey the law. The inconvenience the restrictions create for both teens and their parents was also mentioned in all of the parent groups. One novel complaint about limiting passengers was:

"*There is safety in numbers.*"

This came from a Virginia mother who worries about her daughter's security when she goes to a party alone.

Teens agreed that the passenger restriction minimizes distractions, helping the driver to focus on his or her driving. One actually said that it helps you to get more experience driving alone before you need to take responsibility for driving other people. Another said that it is nice to be able to drive without critics in the car. Another comment was that prohibiting passengers could help by reducing the number of people injured if a teen does crash.

Teens, however, were more verbal in expressing objections to the restriction. One California girl complained that she couldn't even drive her sister. It was inconvenient, because they often were going to the same place.

"*Every teen wants to be able to drive friends around as soon as possible.*"

"*There are many times that someone needs a ride home from an activity and they have to call their parents to pick them up. It would be easier for one of the teen drivers to give them a ride.*"

One teen tried to argue that it is safer to have someone with you because he can look out for things you might not see. Another teen argued that the passenger restriction wastes gas. Several teens mentioned that the main problem with the restriction is that nobody observes it.

An attempt was made in each group to get a count of participants who felt their passenger restriction was "too strict," "too lax," or about right. All of the teens in California felt their law was too strict. Only one of the California parents thought the law was too strict, the rest of the group indicated that it was about right. All of the Massachusetts teens felt their restriction was about right. Four Massachusetts parents said their restriction was about right, but one said it was too strict and three said it was too lax. In Virginia, two of the four teens said the restriction was too strict and the other two said it was about right. The Virginia parent group did not respond to a request for a show of hands on the question. The group was put off by a parent who remarked that it was irrelevant how strict the law was if it was not enforced and largely ignored. Another parent said she would like the Virginia law to allow no passengers. In the discussion that followed, participants who preferred allowing one passenger seemed to slightly outnumber those who preferred no passengers. There also seemed to be slightly more support for the Maryland approach, which only restricts passengers for 6 months, rather than extending to age 18 as the Virginia law does.

All three Massachusetts police officers felt that their restriction was too lax. In a later discussion, it appeared that the problems police face with the existing law was more attributable to the way the DMV and courts have implemented the law than to the restrictions themselves. (The DMV issue relates to the difficulty police officers have in determining whether or not the license is restricted. The court issue is that judges seem reluctant to convict because resulting insurance surcharges are a major financial hit to the defendant. Most cases are continued for 6 months and dismissed if there are no further violations.). Two of the California police officers indicated that their law was too strict, while the remaining police officers felt that it was about right. The two who felt the law was too strict were the same two who complained that their kids suffered unfairly because other kids ignored the law. Two of the three Virginia officers indicated that their law was too lax. Virginia law allows one teen passenger, and has exemptions for family members. These officers preferred a simple law that allowed no passengers until age 18.

Parents and teens were asked a series of risk assessment questions specifically pertaining to the passenger restrictions. All of the parents agreed that having passengers in the car was a greater risk for teens than adults. One mother said that there is a lot of inane talk that goes on between teenagers that is so distracting that she can hardly concentrate on her own driving when her daughter is in the car with her friends. Another mother said:

> "*If you think your kids are going to behave the same with a carload of friends as they do when they are driving with you or alone, you must be dreaming.*"

Parents generally agreed that multiple passengers were a greater risk than just one.

Most of the teens admitted that driving with friends in the car was a greater risk for new teen drivers than for adult drivers. One teen claimed driving with friends was a greater risk because teen drivers are more easily distracted; another responded that it was because teen passengers are more distracting. Other teens mentioned lack of experience and peer pressure as factors. One said that there was more temptation to do things that are risky when friends were in the car. Teens were in general agreement that the risk is greater when there are multiple passengers, compared to just one.

Parents were asked to assess the risk of permitting their children to ride with other teen drivers. The general reaction was that it depends on who the other teen is. Most said there were particular friends they trusted and others they did not trust. Few parents had a blanket prohibition, but some allowed their child to ride with whomever they chose. One mother said her daughter had been involved in a crash while riding with a friend. Now, she is not allowed to ride with any of her friends.

Many teens admitted that they felt at-risk riding with some of their friends, particularly those who they knew were not good drivers. Few of them had parental rules that prohibited them from accepting rides with any of their friends. In most cases, they had certain friends with whom their parents would not let them ride. One girl, who was not allowed to ride with other teens, said she does so anyway.

The few parents who had older children who began to drive before the passenger restriction went in to effect could not shed much light on whether their level of comfort is any higher now that there is a license restriction. In two cases, parents had imposed their own passenger restriction on the older children, so there was no difference. Others said there were too many differences between the children to make a fair comparison.

Eight of the 11 California parents and 5 of the 8 Massachusetts parents indicated that they would have imposed some kind of passenger restriction on their own, even if there were no law. In most cases, however, it would not be a blanket restriction. Most would have prohibited their children from riding with friends whom the parents did not know or who the parents had reason to believe were dangerous drivers. The flow of conversation in Virginia was not conducive to a show of hands on this issue (one of the participants introduced a new topic and the moderator overlooked the question). However, there is no reason to think that the proportions are vastly different.

The prevailing belief among parents was that police did not vigorously enforce the teen passenger restriction. A Massachusetts father said the police did not appear to be enforcing it at all. Others in Massachusetts commented that their children were much more concerned about being pulled over for other violations. (Note: Massachusetts is the only State, among the three, where the violation is a primary offense.) Few, if any, parents in California and Virginia believed that there was enforcement of the passenger restriction. However, most of the parents in Virginia and California believed that a passenger violation was a primary offense. Most were surprised to learn that the passenger restriction was a secondary law in their State. A California parent remarked, “Don’t tell the kids that.”

Results were mixed when teens were asked if they thought that police vigorously enforced the restriction. In Massachusetts, several teens said that they had been stopped for other violations while they had teen passengers in the car and the police said nothing. About half of the Massachusetts teens were surprised to learn that police could pull them over for teen passengers if there was no other violation. One said he was not surprised because he had seen many teens stopped near his school by officers who patrol the school parking lot. While most of the California teens thought police were enforcing the passenger restriction, few thought there was much risk of getting a ticket for violating it. Asked how they reconcile the two beliefs, a few said that they knew it was a secondary law and others said they knew many people who violated the law all of the time and had never received a ticket. None of the Virginia teens believed that there was much enforcement by police. Most of the teens in Virginia knew that passenger restriction violations were a secondary offense, and they couldn’t be pulled over for them. However, all four of the Virginia teens believed that if police pulled them over for another violation and there were illegal passengers in the vehicle that they probably would get a ticket.

According to the sergeant in charge of the Watertown, Massachusetts, traffic enforcement unit, the department takes enforcement of the passenger restriction seriously because the police cannot afford the liability of essentially “unlicensed” drivers to drive away without sanctions. The school resource officer in Watertown’s only high school plays a major role in enforcement, because he knows the students. He knows when they received their licenses because he teaches a one-week class on highway safety for students who are applying for their permits. His presence

in the school essentially stops kids from driving out of the parking lot with a carload of illegal passengers. The school resource officer has no problem with making a primary stop and citing violations. However, what happens a block away is unknown. The patrol officers spontaneously discussed the difficulty they had in making a primary stop. It is often difficult to see who is in a car moving in traffic. It is also difficult to distinguish a teen who is 16-and-a-half from one who is 17. An officer cannot tell when a teen got a license until the officer looks it up. If the passengers are buckled up and are not doing anything suspicious, an officer can't ask them for identification until the officer has established that the driver is under restriction. Since passengers do not need to have identification, it is not uncommon for a lot of them to say they don't have any ID, and then lie about their ages. There was some evidence of frustration with the judicial system in the police comments. Massachusetts police know the outcome of cases because they prosecute the cases themselves. Almost all citations go to court because a guilty plea results in a substantial insurance surcharge. Most first offenses are continued for 6 months and then dropped if there are no further violations. Although the usual sanction is just a $35 fine, police think that judges are reluctant to convict because of the insurance surcharges. There has been no training on enforcement of the teen passenger restriction at the Watertown Police Department, other than a law update. There have been no special enforcement events.

While not empowered to make primary stops for passenger violations, the Fairfax County, Virginia, traffic officers say that they cite the violation every time they observe it on a legal stop. They said that writing tickets is their job. The school resource officer rarely writes tickets, his job being to educate and keep kids safe. Some officers on the force are reluctant to write summonses for juveniles due to past problems with the county's juvenile court system. Although the system has improved, some officers do not believe it. While not specifically targeted at passenger restriction compliance, Fairfax County police conduct two special enforcement events each year. One is held when school starts in the fall and the other around prom and graduation time.

The Los Angeles Police Department highway safety officer said that he would be surprised if more than half of the department's road officers cited teen passenger violations at all. A California Highway Patrol road officer said that he has probably issued fewer than a dozen tickets for passenger restraint violations in his career, but he does not see many violations up on the freeways where he patrols. Since a passenger restriction violation is a secondary offense in California, many officers tend to cite only the stopping violation that generally has more serious sanctions. The sanction for a passenger restriction violation is a fine of $35 plus court costs. The law also calls for community service at the discretion of the judge. Violations do not result in accumulation of points toward suspension. Other than law updates, neither of the California law enforcement agencies (i.e., Los Angeles Police Department, California Highway Patrol) has conducted any formal training on enforcing the passenger restriction. There have been no special enforcement campaigns on the issue. The officers from both California agencies admitted that passenger restriction violations are fairly low on their list of priorities. When asked to compare priorities between seat belts and passenger restrictions, all of the officers ranked seat belts higher.

Few parents, in any State, seemed to be highly motivated to monitor compliance with the law. In Virginia, only the two parents who had driving contracts with their children claimed to

monitor their children's compliance. Several parents admitted that they have allowed their children to violate the restriction. One mother said she allows her son to drive his two friends who live in the neighborhood to football practice, because they are good kids and she knows where they are going. Another mother said that she permits multiple passengers because the law is not enforced, and she knows the kids who are in the car. She said:

> *"I would rather have her transporting three kids whom I know than one kid whom I don't know."*

Nearly all of the teens admitted that they have violated the restriction, at least occasionally. Some admitted to having used strategies like driving around the corner from school to avoid detection by the school resource officer or calling home after dropping their friends off to conceal noncompliance from their parents.

When questioned directly about driving in a caravan as the result of the passenger restrictions, many teens indicated that they had done so. None of the California teens said they had driven in caravan, but a few of the Massachusetts teens and most of the Virginia teens said they had done so. The teens generally thought that driving in caravan could be riskier than having teen passengers. Reasons given for that belief were that it leads to following too close, red light running, and sometimes racing. Most parents and law enforcement officers agreed that the situation happens frequently, and that it probably increases the risk more than having teen passengers in the car.

Twenty-four of the 28 teen participants estimated that less than 25% of their friends always comply with the passenger restriction. The other 4 said they would estimate compliance somewhere between 25% and 50%. One of the Virginia teens remarked that the kids in his school had no fear of being stopped because they all know it is a secondary law. Another said that her friends started out observing the law but started to violate the passenger restriction after they were driving for a month or so. One remarked that he was able to talk his parents out of pressuring him to comply when they learned that nobody else was observing the law. Another teen said he does not think the law is very effective because few people actually follow it. It makes him think twice about carrying passengers, but it has not stopped him.

Virginia police felt that the restriction improved safety because many kids obeyed the restriction, at least around school. The Massachusetts officers, on the other hand, did not think the law was an effective deterrent because kids and parents have many reasons to take their chances of being caught. One officer said:

> *"There are a lot of weak parents who give their kids permission to carry passengers on occasion, knowing that the risk of getting caught is fairly low."*

Another officer added:

> *"Many parents just can't wait to get rid of the task of trucking their kids and kids' friends to activities."*

California police are also doubtful that the law had a great effect. One officer said that in his circle of friends, he couldn't think of any parents who do not allow their teens to transport other teens, at least occasionally.

There were a few suggestions at the end of each discussion regarding how the passenger restrictions could be changed to make them more effective.

Virginia Suggestions

- Virginia police officers would like their law to be a primary law and to be simplified, with fewer exceptions.
- A Virginia parent also suggested that the law be made primary, so it could be enforced.
- Another Virginia mother suggested a class for parents to raise awareness of the law and teach strategies for keeping their children safe.
- A Virginia teen suggested shortening the passenger restriction to 3 or 6 months.
- Another Virginia teen suggested that if the law were primary, compliance would increase from 5% to 95%.

Massachusetts Suggestions

- Massachusetts police did not offer any changes in the law, but suggested that increased compliance must start with the parents. Perhaps, they suggested, there are ways to increase awareness among parents about the benefits of monitoring their teen drivers.
- The Massachusetts teens had no suggestions. One girl commented that it was not enforced anyway, and that is the way she likes it.
- Two Massachusetts parents commented that they would like to see the law go away.

California Suggestions

- The California police suggested more police involvement in driver education and more publicity to motivate parents to monitor their children's compliance.
- One officer suggested that parents should be made more aware that they can suspend their child's license by withdrawing consent.
- California teens suggested that the duration of the restriction should go back to 6 months and that you should be allowed to transport family members, even in non-emergencies, and without applying to the DMV for an exemption.

IV. CONCLUSION

Crash Data

The results of this study support prior research suggesting that passenger restrictions reduce highway loss (e.g., Zwicker et al., 2006).

There was a consistent effect across all three States showing a decrease in 16-year-old driver crash involvements. The effect did not always show up with 15- and 17-year-old drivers included. The reduction in 16-year-old driver crashes may be offset by an increase in overall injuries to 16-year-olds (as they may now become pedalcyclists or pedestrians). Additionally, it is possible that the law change would defer crashes until teens were older (18 and 19) when they drive unrestricted. Thus, a decrease in 16-year-old driver crashes could be offset to some extent by an increase in crashes among 18- and/or 19-year-old drivers who are now driving for the first time in these higher risk situations (i.e., with passengers). Both of these possible "side effects" of the passenger restriction, however, were unfounded. There was actually a decrease in overall 16-year-old injuries in all three States. There was also no increase in 18- and 19-year-old driver crashes.

It is important to take into consideration the possibility that changes in crashes are due to some general change in crash rates (e.g., due to a change in the economy). This possibility was explored in two ways: (1) a covariate was used to counteract any trends that may exist in a given region, and (2) analyses were conducted on theoretically unaffected groups—35- to 49-year-olds. That is, if there was a decrease in crashes for this comparison group a similar decrease in crashes among the 16-year-old drivers would become suspect and perhaps would need to be attributed to an uncontrolled factor. However, the results on this older comparison group indicated no change in crash rates.

The final question remaining is to what extent the decrease in crashes are due to a passenger restriction versus some other component of GDL. Analyses show a decrease in the number of crashes occurring with "illegal" passenger makeup. This effect was significant in two of the States (Massachusetts and Virginia). Thus, at least some of the decrease in 16-year-old driver crashes may be attributable to a decrease in crashes occurring with teen passengers.

The effects of the passenger restriction were even present when a law was strengthened. Massachusetts and California went from no passenger restriction to a strong passenger restriction. Virginia, however, strengthened a previously weak restriction and still showed a reduction in crashes and injuries.

Focus Groups

Compliance with teen passenger restrictions was very low among newly licensed teen drivers that participated in the focus groups. While the focus group parents and teens acknowledged that driving with friends in the car increases the risk of crashes for young inexperienced drivers, they did not feel personally at risk. Many of the focus group parents attempted to control this risk by forbidding their children from carrying passengers whom the parents did not know and/or did not trust. There was a feeling among both parents and teens that

the passenger restriction places an unfair burden on people who are responsible and want to be law abiding because most other teens simply ignore the law. Both the parents and the teens perceived that the law was rarely enforced. Law enforcement agencies confirmed that the law was difficult to enforce, even when non-compliance is a primary violation.

Parent Groups

Nearly all parents recognized that teen passengers increase the risk of crashes and injuries among newly licensed teen drivers. As a result, many parents imposed some rules and restrictions on the circumstances in which their newly licensed teenagers were allowed to drive. Usually, they imposed a curfew, and often a passenger restriction. A surprisingly large number of the participating families (11 of 57) had written parent/teen behavioral contracts regulating driving for a period of time after licensure.

Although generally favorable toward the concept of Graduated Driver Licensing laws, many parents were ambivalent. Most recognized the need for such laws, but many felt the laws were unfair to their own children, because they perceived their children as responsible and capable drivers. Some parents liked the GDL because they would have imposed restrictions anyway, and the law saved them the trouble of negotiating the restrictions.

All parents were aware that there was a curfew and passenger restriction, although many were unsure or mistaken about the details of their State's law. The major perceived benefits of the passenger restriction were that it reduces distractions and eliminates peer pressure to engage in risky driving behavior. Two major criticisms of the passenger restriction included the fact that it is not routinely enforced and parents felt that many of their children's friends paid no attention to it. Few parents believed that the teen passenger restriction is vigorously enforced, even in Massachusetts where non-compliance is a primary violation. Usually, parents restricted their teens from carrying passengers whom they do not know or particular friends they had reason to believe would be a bad influence, but many permitted their children to violate the law when they felt the risk was acceptable. Very few parents monitored their children's compliance with the legal passenger restrictions.

Teen Groups

Teens generally agreed that driving with teen passengers in the car increases the risk of crashes and injuries. While most teens did not like having parentally imposed rules and restrictions on their driving, most teens had some rules and restrictions, and were resigned to accepting them.

Teens were generally more knowledgeable about the Graduated Driver Licensing laws in their State than parents were, but many had misconceptions (e.g., timeframes for nighttime restrictions, length of time passenger restrictions are in effect, etc.). While acknowledging the benefits of teen passenger restrictions, teens expressed more objections than parents did (e.g., inconvenient, wasteful of gasoline, etc.). Teens were somewhat more likely than parents to believe that police were enforcing the passenger restriction, but most perceived the likelihood of getting a ticket as very low. Some teens knew that non-compliance was a secondary violation in their State, but many did not. Most teens knew that many of their friends violated the restriction all the time and had never been ticketed for it.

Very few teens complied with the passenger restriction all of the time. Some violated the restriction with their parents' permission and others avoided situations where their parents would know about it. Some attempted to avoid tickets by not carrying passengers in view of police at school and obeying traffic laws to avoid a stop.

Law Enforcement Groups

Police in all three States acknowledged that carrying teen passengers increases the risk of crashes and injuries among young drivers. Generally, police officers were in favor of Graduated Driver Licensing and felt that the passenger restriction is more important than the curfew from a highway safety viewpoint. All of the participating law enforcement agencies had outreach programs to educate new teen drivers and parent groups on safe driving practices, including the passenger restriction.

Police in all three States said that their State's teen passenger restrictions were difficult to enforce. Although non-compliance with the passenger restriction is a primary violation in Massachusetts, few primary stops are made because it is difficult to judge the age of occupants in a moving vehicle. Even after a stop for another violation, passenger restriction citations are difficult because a registry check is required to determine if the driver has been licensed less than 6 months, and passengers are not required to produce identification without probable cause (Massachusetts only). Virginia traffic patrol officers reported that they cite every passenger restriction violation they can when making a legal stop. While Virginia officers can determine whether the driver is restricted from information shown on the license, they have some difficulty in determining the age and relationship of the passengers before writing a citation. Officers complained about the sibling exemption. California officers had no complaints about difficulties in writing passenger restriction citation after making a legal stop because restricted licenses are clearly marked and exceptions require prior authorization by the DMV.

Police in all States acknowledged that outside of the traffic enforcement units, few officers wrote many passenger restriction citations. Other officers had higher priorities and, when making a traffic stop, usually only wrote a ticket for the stopping violation. Factors that discouraged law enforcement officers from citing violations include sympathy for the violators and lenient treatment of juvenile violators by the courts. Other than law updates, none of the police departments have conducted any training on enforcement of passenger restrictions. None of the departments have conducted any special emphasis patrols on passenger restrictions, although the Fairfax County Virginia Police do have special traffic enforcement patrols around schools in the fall and spring.

Summary

The crash data analyses support the contention that passenger restrictions reduce crashes among 16-year-old drivers. This decrease does not appear to be offset by increases in other types of crashes or an increase in overall injuries. The focus groups indicated that there are some difficulties with the law. Parents were sometimes inconvenienced by the law and failed to enforce it when they knew the teen passengers who would be riding with their child. Teens, too, were inconvenienced and reported violating the restriction at least on occasion; some teens violated the restriction more often. The police indicated that the law was often difficult to

enforce even when it is a primary law. Despite this, it appears that even incomplete adherence to the law had a positive impact on teen driver crashes.

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VI. APPENDIX A --ARIMA TABLES

California

Sixteen-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.808	.058	13.907	.000
Seasonal Lags	Seasonal AR1	.352	.093	3.774	.000
Regression Coefficients	Law Change	-.127	.059	-2.152	.034
	AZ Covariate	.068	.024	2.847	.005
Constant		.861	.083	10.361	.000

Melard's algorithm was used for estimation.

Fifteen- to 17-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.754	.064	11.705	.000
Seasonal Lags	Seasonal AR1	.520	.085	6.154	.000
Regression Coefficients	Law Change	-.052	.036	-1.467	.145
	AZ Covariate	.055	.027	2.067	.041
Constant		.741	.064	11.654	.000

Melard's algorithm was used for estimation.

All 16-year-olds injured or killed (in any capacity) per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.667	.073	9.183	.000
Seasonal Lags	Seasonal AR1	.481	.090	5.360	.000
Regression Coefficients	Law Change	-.130	.058	-2.241	.027
	AZ Covariate	.037	.029	1.256	.212
Constant		1.191	.090	13.252	.000

Melard's algorithm was used for estimation.

All 15- to 17-year-olds injured or killed (in any capacity) per 1,000 population (*with* AR = 16)

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.814	.066	12.416	.000
	AR16	-.165	.055	-2.984	.004
	MA1	.394	.115	3.409	.001
Seasonal Lags	Seasonal AR1	.994	.023	42.295	.000
	Seasonal MA1	.891	.203	4.388	.000
Regression Coefficients	Law Change	-.138	.021	-6.608	.000
	AZ Covariate	.110	.029	3.808	.000
Constant		.985	.072	13.733	.000

Melard's algorithm was used for estimation.

All 15-17 year-olds injured or killed (in any capacity) per 1,000 population (*without* AR = 16)

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.974	.026	37.767	.000
	MA1	.585	.090	6.518	.000
Seasonal Lags	Seasonal AR1	.989	.015	67.704	.000
	Seasonal MA1	.793	.131	6.070	.000
Regression Coefficients	Treatment	-.010	.038	-.270	.788
	AZ Covariate	.079	.029	2.706	.008
Constant		.967	.320	3.027	.003

Melard's algorithm was used for estimation.

Thirty-five- to 49-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.954	.037	25.833	.000
	MA1	.733	.095	7.754	.000
Seasonal Lags	Seasonal AR1	.488	.095	5.136	.000
Regression Coefficients	Law Change	-.005	.080	-.067	.946
	AZ Covariate	.499	.138	3.617	.000
Constant		1.994	.277	7.205	.000

Melard's algorithm was used for estimation.

All 35- to 49-year-olds injured or killed (in any capacity) per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.926	.051	18.127	.000
	MA1	.605	.115	5.235	.000
Seasonal Lags	Seasonal AR1	.478	.094	5.079	.000
Regression Coefficients	Law Change	.066	.066	.995	.322
	AZ Covariate	.520	.140	3.708	.000
Constant		1.507	.211	7.127	.000

Melard's algorithm was used for estimation.

Eighteen- to 19-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.410	.089	4.609	.000
Seasonal Lags	Seasonal AR1	.591	.078	7.615	.000
Regression Coefficients	Law Change	.059	.045	1.321	.189
	AZ Covariate	.194	.041	4.771	.000
Constant		1.295	.152	8.534	.000

Melard's algorithm was used for estimation.

Sixteen-year-old driver crash involvements per 1,000 population with passengers younger than 20

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.907	.046	19.628	.000
	MA1	.355	.112	3.171	.002
Regression Coefficients	Law Change	-.063	.032	-1.967	.052
	AZ Covariate	.047	.019	2.479	.015
Constant		.254	.039	6.520	.000

Melard's algorithm was used for estimation.

Twenty- to 34-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.845	.109	7.723	.000
	MA1	.612	.167	3.665	.000
Seasonal Lags	Seasonal AR1	.483	.090	5.364	.000
Regression Coefficients	Law Change	.026	.034	.772	.442
	AZ Covariate	.146	.045	3.253	.002
Constant		1.031	.129	8.003	.000

Melard's algorithm was used for estimation.

Appendix A (Continued)

Massachusetts

Sixteen-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.269	.109	2.469	.016
Regression Coefficients	CT Covariate	.083	.068	1.227	.224
	Law Change	-.160	.041	-3.954	.000
Constant		.794	.064	12.390	.000

Fifteen- to 17-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.346	.107	3.222	.002
Seasonal Lags	Seasonal AR1	.250	.115	2.167	.033
Regression Coefficients	CT Covariate	.238	.086	2.766	.007
	Law Change	-.125	.038	-3.270	.002
Constant		.772	.071	10.810	.000

Highway injury/death of 16-year-olds (whether as drivers, passengers, or nonoccupants) per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.353	.106	3.318	.001
Seasonal Lags	Seasonal AR1	.235	.112	2.097	.039
Regression Coefficients	Law Change	-.461	.103	-4.459	.000
Constant		2.152	.073	29.315	.000

Highway injury/death of 15- to 17-year-olds per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.266	.110	2.428	.017
Seasonal Lags	Seasonal AR1	.325	.111	2.926	.004
Regression Coefficients	Law Change	-.350	.073	-4.829	.000
Constant		2.138	.053	40.081	.000

Thirty-five- to 49-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.226	.107	2.119	.037
Seasonal Lags	Seasonal AR1	.570	.091	6.251	.000
Regression Coefficients	CT Covariate	.671	.110	6.075	.000
	Law Change	.013	.022	.600	.551
Constant		.422	.077	5.458	.000

Highway injury/death of 35- to 49-year-olds (whether as drivers, passengers, or non-occupants) per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.342	.103	3.310	.001
Seasonal Lags	Seasonal AR1	.554	.092	6.029	.000
Regression Coefficients	Law Change	-.022	.038	-.592	.555
Constant		1.141	.033	34.208	.000

Eighteen- to 19-year-old driver crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Regression Coefficients	CT Covariate	.500	.081	6.168	.000
	Law Change	-.079	.037	-2.135	.036
Constant		.993	.120	8.280	.000

Melard's algorithm was used for estimation.

Sixteen-year-old drivers with passenger(s) younger than 20 and without an occupant older than 25

- **Two-vehicle crashes**

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.314	.107	2.945	.004
Regression Coefficients	Law Change	-.089	.018	-5.076	.000
Constant		.208	.012	17.987	.000

- **Single-vehicle crashes**

		Estimates	Std Error	t	Approx Sig
Seasonal Lags	Seasonal AR1	.230	.113	2.039	.045
Regression Coefficients	Law Change	-.045	.008	-5.562	.000
Constant		.089	.006	16.061	.000

Melard's algorithm was used for estimation.

Virginia

Sixteen-year-old drivers in injury crashes per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	MA1	-.626	.106	-5.905	.000
Regression Coefficients	Law Change	-.381	.079	-4.841	.000
	MD Covariate	.424	.131	3.228	.002
Constant		1.003	.138	7.271	.000

Melard's algorithm was used for estimation.

All injured 16-year-olds

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	MA1	-.531	.114	-4.670	.000
Seasonal Lags	Seasonal AR1	.289	.138	2.094	.041
Regression Coefficients	Law Change	-.438	.109	-4.013	.000
	MD Covariate	.458	.123	3.720	.000
Constant		1.470	.243	6.051	.000

Melard's algorithm was used for estimation.

All injured 15- to 17-year-olds

		Estimates	Std Error	t	Approx Sig
Regression Coefficients	Law Change	-.211	.040	-5.202	.000
	MD Covariate	.854	.075	11.421	.000
Constant		-.036	.175	-.206	.837

Melard's algorithm was used for estimation.

All injured 35- to 49-year-olds

		Estimates	Std Error	t	Approx Sig
Regression Coefficients	Law Change	.008	.011	.758	.451
	MDall35_49	.519	.048	10.702	.000
Constant		.256	.061	4.175	.000

Fifteen- to 17-year-old drivers in injury crashes per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	AR1	.552	.122	4.521	.000
Regression Coefficients	Law Change	-.182	.054	-3.355	.001
	MD Covariate	.573	.134	4.265	.000
Constant		.577	.114	5.073	.000

Melard's algorithm was used for estimation.

Sixteen-year-old drivers with more than one passenger under age 18 (i.e., "violating" passenger restriction) in injury crashes per 1,000 population

		Estimates	Std Error	t	Approx Sig
Regression Coefficients	Law Change	-.029	.009	-3.130	.003
	MD Covariate	.205	.047	4.401	.000
Constant		.027	.020	1.348	.183

Melard's algorithm was used for estimation.

Thirty-five- to 49-year-old drivers in injury crashes per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	MA1	-.296	.126	-2.346	.023
Seasonal Lags	Seasonal AR1	.581	.119	4.887	.000
Regression Coefficients	Law Change	-.008	.013	-.645	.522
	MD Covariate	-.126	.082	-1.532	.131
Constant		.674	.054	12.548	.000

Melard's algorithm was used for estimation.

Eighteen- to 19-year-old driver injury crash involvements per 1,000 population

		Estimates	Std Error	t	Approx Sig
Non-Seasonal Lags	MA1	-.624	.100	-6.256	.000
Seasonal Lags	Seasonal AR1	.553	.121	4.584	.000
Regression Coefficients	Law Change	-.013	.060	-.216	.830
	MD Covariate	.077	.088	.877	.384
Constant		1.451	.137	10.567	.000

Melard's algorithm was used for estimation.

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