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Teenage crash reduction associated with delayed licensure in Connecticut

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Abstract

Problem: On January 1, 1997, Connecticut implemented the first phase of graduated licensing requiring 16- and 17-year-olds to hold a learner's permit for 6 months (4 months with driver's education) prior to licensure. The effect of this change was to raise the minimum licensing age in Connecticut by 6 months (or 4 months) during which time a young person could obtain supervised practice driving. **Method:** Crash rates for 16- to 18-year-olds in Connecticut, before and after the change, were compared with crash rates in nearby counties in New York State. **Results:** Fatal/injury crash involvements of Connecticut 16-year-old drivers declined by 22% during the first full year following the law change. Declines did not vary significantly between males and females or as a function of the income level of the city/town in which the crash occurred. Fatal/injury crash involvements for 17- and 18-year-olds in Connecticut and 16-, 17-, and 18-year-olds in New York did not change significantly. **Discussion:** Companion surveys of parents conducted before and after their teen was licensed showed support for the law change and support for additional provisions generally associated with "graduated licensing." **Summary:** Delaying teenage licensure in Connecticut, during which time a teen could engage in more practice driving, was associated with a 22% reduction in fatal/injury crash involvements for 16-year-old drivers. **Impact on Industry:** Crash reduction will be related to a reduction in overall highway loss including medical costs, property damage, and lost work time. © 2001 National Safety Council and Elsevier Science Ltd. All rights reserved.

Keywords: Graduated licensing; Teenage drivers; Learner's permits; Fatal/injury crash involvements

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1. Introduction

The motor-vehicle crash involvement rate for young drivers is much higher than that for older drivers whether the rate is based on population, number of licensed drivers, or reported miles driven (Massie, Campbell, & Williams, 1995; Williams, Preusser, Ulmer, & Weinstein, 1995). For example, 16-year-olds have almost 10 times the crash risk of drivers ages 30–59 and almost three times the risk of older teenagers (Williams, 1996). Immaturity and driver inexperience have been cited as major contributors to these high rates (Mayhew & Simpson, 1990). The elevated fatal crash risk of 16-year-olds is primarily one of licensed drivers. For instance, between 1994 and 1998, there were 6,145 16-year-old drivers involved in fatal crashes, with 86% of them holding a valid license and 3% holding a learner's permit. Only 9% of these drivers had neither a license nor permit, and 1% had a suspended or revoked license (National Highway Traffic Safety Administration, 1994–1998). A substantial number of people in the United States first obtain their driver's licenses at age 16. In 1997, 43% of 16-year-olds, both males and females, was reported to have been licensed and this rate has remained largely unchanged for the past 20 years (Federal Highway Administration, 1998).

Once a teenager obtains a driver's license, the frequency and the amount of driving increases substantially. For example, a large multistate survey of transportation needs and practices of high school students reported that among those who did not have a driver's license or learner's permit, fewer than 2% reported driving more than 50 miles/week. Among the students with learner's permits, only 5% reported driving more than 50 miles/week, whereas 44% of those with licenses reported driving more than 50 miles/week (Preusser, 1988).

There is accumulating evidence that restricting the driving of those who are newly licensed and/or delaying the age at which unrestricted driving is permitted reduces crash rates for young people. For example, eliminating state funding in Connecticut for high school driver education resulted in delays in licensure and a reduction in young driver crashes (Robertson, 1980). Similarly, a provision in Louisiana requiring 15-year-olds to complete driver education before becoming licensed reduced the fatal and injury crash involvements of this age group (Ulmer, Preusser, Ferguson, & Williams, 1999). Conversely, steps that reduce the age at which full licensure occurs, such as permitting earlier licensing when driver education has been completed, serve to increase crash rates. For example, Preusser (1988) found that students from states where teenagers typically were licensed at an early age reported more driving, risky driving, and crashes and violations than students in states that did not typically license until teenagers were somewhat older. The involvement rate for young drivers in fatal crashes has been shown to be greater in states that permit earlier practice driving and licensure than in states that delay licensure (Preusser, 1996; Preusser, Ferguson, Williams, Leaf, & Farmer, 1998). A study of fatal and injury crash involvements of 16-year-olds in several states with differing licensing practices reported that rates were highest in states that allowed easy

access to full licensure and lower in states that restricted initial licenses (Ferguson, Leaf, Williams, & Preusser, 1996).

Recently, there has been a movement among U.S. states toward increasing the minimum age at which an unrestricted driver's license can be obtained. Many states have adopted graduated licensing, a system designed to phase in driving so that beginners can gain experience under supervised (learner's permit) and lower-risk (intermediate license) driving situations prior to unrestricted full-privilege licensure (Insurance Institute for Highway Safety, 1999; Insurance Institute for Highway Safety and Traffic Injury Research Foundation, 1999). There is increasing evidence that graduated licensing can lead to crash reductions among beginning drivers (Langley, Wagenaar, & Begg, 1996; Mayhew, Simpson, & des Groseilliers, 1999; Ulmer, Preusser, Williams, & Ferguson, 2000).

In 1996, Florida became the first U.S. state to adopt a comprehensive graduated licensing system including an extended learner's phase, an intermediate phase prohibiting unsupervised nighttime driving, and delayed full licensure if traffic violations are accumulated. A 9% reduction in the injury crash involvement rate for 15- to 17-year-olds was reported (Ulmer, Preusser, Williams & Ferguson, 2000). In 1994, Nova Scotia adopted a graduated licensing system applicable to all novice drivers regardless of age. The provisions include a 6-month learner phase and a 2-year intermediate phase during which unsupervised nighttime driving is prohibited. An evaluation of the Nova Scotia system reported a 37% decline in the crash involvement rate for 16-year-old drivers during the first 3 years of the program (Mayhew et al., 1999).

On January 1, 1997, Connecticut modified its licensing requirements for 16- and 17-year-olds by adopting one component of graduated licensing: a mandatory learner's permit. Prior to this date, 16- or 17-year-olds seeking to obtain a driver's license were required to have a home training or driving school certificate involving a 5-h course of study on safe driving practices and a minimum of six hours of behind-the-wheel instruction. Those choosing the home training option had to wait 30 days following their 16th birthday to get a license. Learner's permits were not issued; rather, supervised practice driving generally was permitted for people 16 years and older.

Beginning January 1, 1997, 16- and 17-year-olds seeking to obtain a driver's license are required to have either a public secondary driving school certificate, a commercial driving school certificate, or a home training certificate. Those with a home training certificate must have held the learner's permit for at least 180 days. Those with a commercial or secondary school certificate must have held the learner's permit for at least 120 days. Learner's permits cannot be obtained until age 16. During the learner's period, only supervised driving is permitted, and driving on limited access highways is prohibited for the first 90 days of the permit period. Also, the six hours limit of required behind-the-wheel instruction was increased to eight hours. Connecticut considered, but did not adopt, an intermediate licensing phase including a nighttime driving restriction.

Because young drivers cannot obtain a learner's permit until age 16, one effect of this change was to add 4–6 months to the minimum age at which a license can

be obtained. Therefore, this change provides the opportunity to examine the effect of a delay in teenage licensure during which additional supervised practice driving may occur. This study compares crash involvements among 16- to 18-year-olds in 1997 (the first full year of the new licensing requirements) with the previous year. Crash involvements among teenage drivers from nearby counties in New York also were compared.

2. Methods

Using the method described by Ferguson, Leaf, Williams & Preusser. (1996), crash rates based on the number of fatal- and injury-crash-involved drivers per 10,000 population were calculated for 16-, 17-, and 18-year-olds in 1996 and 1997. Crash ratios then were formed by dividing the crash rate for each of these age groups by the rate for 25- to 54-year-olds, used as a reference group to control for other in-state factors that could affect crashes. For example, let p_{196} represent the annual crash rate of 16-year-olds in Connecticut per 10,000 population in 1996 (the last full year prior to the law change), and p_{296} represent the crash rate of the reference group that year. The crash rate ratio is defined as:

$$r_{96} = p_{196}/p_{296}.$$

Strictly, the crash rates are random variables so the mean and variance of the crash rate ratio will depend on the means and variances of these random variables. However, because the reference group has many times more individuals than the target group, the variance of p_{296} is very small, making it reasonable to consider it a constant. If a crash rate ratio for Connecticut 16-year-olds in 1997 (the first full year with the new law) is similarly defined as r_{97} and both rate ratios are approximated by the normal distribution, then the appropriate statistic to test for differences in crash ratios between 1996 and 1997 is:

$$z = (r_{97} - r_{96})/(v_{97} + v_{96})^{\frac{1}{2}},$$

where

$$v_{97} = (1/p_{297}^2)p_{197}(1 - p_{197})/n_{197}$$

and

$$v_{96} = (1/p_{296}^2)p_{196}(1 - p_{196})/n_{196}.$$

To provide additional evidence that any change in crash rates among 16- to 18-year-old drivers in Connecticut was due to the change in licensing requirements and not other factors that may have affected crash rates among 16- to 18-year-old drivers in general (e.g., economic factors), similar ratios were calculated

for the six New York counties that lie immediately to the west of Connecticut (Dutchess, Orange, Putnam, Rockland, Ulster, and Westchester). These counties bear reasonable socioeconomic, geographical, and transportation similarities to Connecticut. Importantly, the conditions of new driver licensing during this period remained unchanged in these New York counties, where 16-year-olds can become licensed but are subject to a nighttime driving restriction until age 17 with driver education or age 18 without.

The crash data used in the study came, respectively, from the Connecticut Department of Transportation, which provided copies of its computer crash data tapes, and from the New York State Department of Motor Vehicles, which provided tabulations of crash involvements. The population data came from published U.S. Census Bureau estimates for 1996 and 1997. In an attempt to look at the role of a reduced learner's permit period among those taking driver education, information concerning whether or not a Connecticut city/town provided in-school driver education was obtained by calling each of the state's public high schools during November and December 1996. The $P<.01$ significance level was adopted for all statistical tests.

3. Results

3.1. Crash rates

Population estimates, numbers of fatal- and injury-crash-involved drivers, crash rates per 10,000 population, and the crash rate ratios by driver age for Connecticut and the New York counties are listed in Table 1. Also listed for the

Table 1
Population estimates, crash involvements, crash rates, and crash rate ratios

	Population estimates		Drivers in fatal/injury crashes		Drivers in fatal/injury crashes per 10,000 population		Fatal/injury crash rates relative to 25- to 54-year-olds	
Driver age (years)	1996	1997	1996	1997	1996	1997	1996	1997
Connecticut								
16	41,721	40,879	1351	977	324	239	1.28	1.00
17	39,387	40,480	1612	1650	409	408	1.62	1.71
18	36,970	38,076	1704	1809	461	475	1.82	1.99
25–54	1,479,681	1,480,993	37,446	35,395	253	239	1.00	1.00
New York[a]								
16	26,480	26,257	718	623	271	237	1.07	0.99
17	25,495	26,329	1086	1078	426	409	1.68	1.70
18	23,307	23,646	1139	1100	489	465	1.92	1.94
25–54	920,386	925,793	23,368	22,247	254	240	1.00	1.00

[a] Dutchess, Orange, Putnam, Rockland, Ulster, and Westchester counties.

Table 2
Changes in crash rate ratios

Driver age (years)	State	Percent change 1997 versus 1996
16	Connecticut	−21.8**
	New York[a]	−7.5
17	Connecticut	5.5
	New York[a]	1.5
18	Connecticut	9.1
	New York[a]	0.6

[a] Dutchess, Orange, Putnam, Rockland, Ulster, and Westchester counties.
** $P<.01$ by z test; 1997 versus 1996 in Connecticut; and Connecticut (−21.8%) versus New York (−7.5%).

various age groups are the crash rate ratios for 1996 and 1997. As noted, these ratios were formed by dividing the crash rates for each age group by the rate for 25- to 54-year-olds. The percentage changes in crash ratios in Connecticut and New York from 1996 to 1997 for 16-, 17-, and 18-year-olds are shown in Table 2. The crash rate ratio for 16-year-olds in Connecticut declined by almost 22%, a statistically significant change ($z=6.00$, $P<.01$). The ratio for 16-year-olds in the New York counties also declined, but the difference was not statistically significant ($z=1.45$, N.S.). The decline for Connecticut 16-year-olds was significantly greater than that for New York 16-year-olds ($z=-2.75$, $P<.01$). Ratios for 17-year-olds ($z=0.70$, N.S.) and 18-year-olds ($z=1.53$, N.S.) in Connecticut versus New York did not change significantly.

3.2. Cities/towns

The 169 cities/towns in Connecticut were analyzed separately as a function of per capita income (in quartiles), population, and whether or not in-school driver education was provided by the city/town's public high school(s). Table 3 shows the raw numbers of fatal and injury crash involvements of 16-year-old drivers as a function of these characteristics. Comparing the numbers of crashes in 1997 versus 1996 did not indicate any statistically significant difference in their distribution as a function of city/town per capita income, population, or the availability of in-school driver education. Note, however, that the data in Table 3 are based on the city/town in which the crash occurred, which may or may not be the same city/town in which the 16-year-old driver resided.

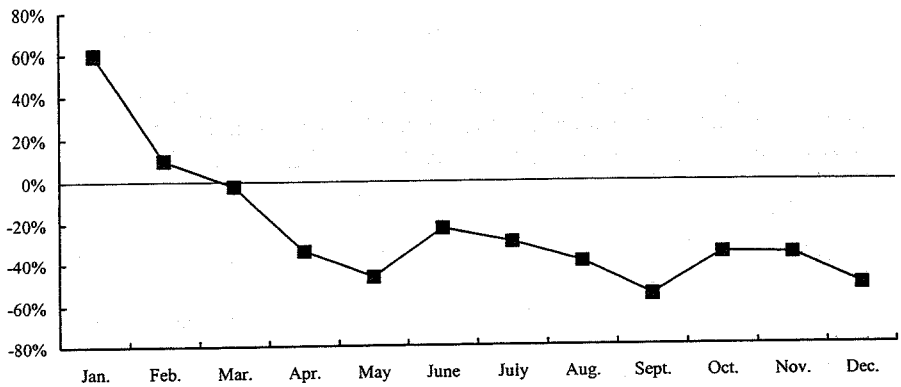
3.3. Month

The new licensing provisions went into effect on January 1, 1997. That is, a 16-year-old who began the licensing process in 1997 had to obtain a learner's permit, whereas if the application had been made in late 1996, no learner's permit was required. At the beginning of 1997, most 16-year-olds in Connecticut had turned 16 in 1996. As 1997 progressed, more and more teenagers turned 16 and were licensed under the 1997 law. In January 1997, approximately 11/12 of 16-

Table 3
Number of fatal and injury crash involvements of 16-year-old drivers in 1996 versus 1997, as a function of characteristics of the cities/town

	1996 (*N*)	1997 (*N*)	Percent change
Per capita income			
Quartile 1	335	234	−30
Quartile 2	344	260	−24
Quartile 3	279	223	−20
Quartile 4	392	260	−34
Population			
≥100,000	168	132	−21
50,000–99,999	265	211	−20
20,000–49,999	498	303	−39
10,000–19,999	298	214	−28
<10,000	121	117	−3
Driver education			
Yes	532	377	−29
No	802	594	−26

year-olds would have turned 16 in 1996 and could have been licensed under the old law, whereas 1/12 would have turned 16 in 1997 and were now required to hold a learner's permit for 4–6 months. By mid-year, approximately half of the 16-year-olds would have turned 16 in 1996 and half in 1997. Other factors being equal, the expectation is that month-to-month crash rate differences between 1996 and 1997 would be small in the early months of the year (due to fewer "old



Note: Data points represent number of 16-year-old driver crash involvements during 1997, minus the number during 1996 divided by number during 1996 (i.e., percent change 1996 vs. 1997). For instance, during January 1997, there were 60 percent *more* crash involvements than in 1996, 10 percent more in February, and 2-55 percent fewer during the remaining months of 1997.

Fig. 1. Monthly differences in 16-year-old driver fatal/injury crash involvements, 1997 versus 1996.

law" eligible 16-year-olds) and increase in the later months. This difference might even be negative if, for instance, some 16-year-olds decided to become licensed in late 1996, at an earlier time than might otherwise have been the case, in order to avoid the change in the law on January 1, 1997.

Fig. 1 shows the monthly percentage differences between the numbers of 16-year-old driver fatal/injury crash involvements in 1997 versus 1996. As expected, crashes in January 1997 were 60% higher than in January 1996, possibly brought about by a rush to license among 16-year-olds. Crash involvements in February and March 1997 were about equal to those a year earlier and then fell sharply for each of the remaining months of the year. Similar comparisons for 17- and 18-year-olds, by month for 1997 versus 1996, were unremarkable. For instance, for January, the changes were +1% and +5% for 17- and 18-year-olds, respectively.

4. Discussion

Connecticut, for many years, has required 16- and 17-year-olds to complete driver education or home training before they could become licensed. Prior to 1997, the state did not issue learner's permits, so the driver education/training requirement and licensing tests were all that stood between a new 16-year-old and full licensure. These requirements could be satisfied in 30 days or less after reaching 16 years of age. Beginning in January 1997, 16- and 17-year-olds are required to hold a learner's permit for a minimum time period before being eligible for a driver's license. The effect of this legislation was to delay the licensing of 16-year-olds until they were at least 16 years, 4 months with driver education or 16 years, 6 months with home training. Results of the present study indicate a significant decline in fatal/injury crash involvements of 16-year-olds in Connecticut following adoption of the required learner's permit holding period.

No change was found in the crash involvements of 17-year-olds despite the fact that this age group also was subjected to the learner's permit requirements. It is possible that older 16- and 17-year-olds, who otherwise would have delayed beginning the licensing process, opted to commence earlier because of the anticipated change in the licensure requirements. Unfortunately, data on licenses issued to various age groups could not be obtained, so the finding regarding 17-year-olds cannot be clarified further.

The present study covers only the first year of the law change. It is expected that in subsequent years, the effects for 16-year-olds will be greater because all 16-year-olds will be subject to the new requirements. In addition, the rush to licensure that may have resulted in higher crash rates for the first few months of 1997 is a one-time occurrence. It is presumed that most, but not all, 17-year-olds in Connecticut in 1997 were licensed under the old law; in subsequent years, most will be licensed under the new law. Compared with 17-year-olds licensed in earlier years, they will have a longer period of supervised driving and a shorter

period of full-privilege licensed driving prior to age 17. It is not known how this will affect crash rates.

Crash reductions generally were uniform as a function of the characteristics of the city/town in which the crash occurred. Driver education is widely offered throughout Connecticut, with the primary distinction being the location in which it is taken (privately or in school), not general availability or cost. As a practical matter, in-school driver education is not free of charge. Offering early licensure based on completion of driver education has been shown to increase crash rates (see, e.g., Boase & Tasca, 1998); however, the absence of a difference in crash rates between communities with and without in-school driver education was not surprising. To study the actual effects of allowing driver education students to be licensed 2 months earlier, it would be necessary to identify which 16-year-olds took driver education and how long they held their permits, and this was not possible given the data available.

Williams, Ferguson, Leaf, & Preusser (1998) surveyed the parents of 15-year-olds in Connecticut shortly before the implementation of the licensing change. Although there was recognition that they and their teenagers would be inconvenienced to some extent, 91% of parents said they supported the minimum holding period requirement for learner's permits. Eighty-two percent of parents said they favored a nighttime driving curfew, a provision considered by the Connecticut legislature but not passed. A follow-up survey with these same families 3 years later reported that these parents were even more supportive of the minimum holding period requirement for learner's permits and more supportive of nighttime driving restrictions (Ferguson, Williams, Leaf, & Preusser, 1999). Eighty percent of parents said they had imposed their own nighttime driving restrictions when their teenagers were first licensed. Moreover, the percentage of parents who thought they would be inconvenienced or thought it would be much harder for their teenagers to get to school and a job declined substantially.

The practical effect of the new Connecticut law was to delay licensure by as much as 4–6 months for 16-year-olds during which time additional supervised practice driving could occur. Results for the first full year following the change indicated that crash involvements of 16-year-old drivers declined by 22%.

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