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Journal of Safety Research 39 (2008) 47 – 54

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Crashes of novice teenage drivers: Characteristics and contributing factors

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Received 11 February 2007; received in revised form 30 July 2007; accepted 12 December 2007
Available online 18 January 2008

Abstract

Objective: The initial months of licensure are especially hazardous for teenagers. Factors leading to crashes of novice 16-year-old drivers were identified. *Method:* Sixteen year-olds in Connecticut who were involved in nonfatal crashes during the first 8 months of licensure were interviewed, and police crash reports were examined. Crash types and contributing factors were identified. *Results:* Three-fourths of the crash-involved teenagers were at fault. Their crashes resulted primarily when they ran off the road, rear ended another vehicle, or collided with another vehicle that had the right-of-way. Three factors contributed about equally to their crashes: failing to detect another vehicle or traffic control, speeding, and losing control of the vehicle or sliding. Slippery roads also were an important factor. Most failures to detect another vehicle or traffic control involved not looking thoroughly, distraction, or inattention. *Discussion:* Based on the findings, potential countermeasures for reducing crashes of novice teenage drivers include adequate practice driving, in-vehicle monitoring devices, and electronic stability control. *Impact on industry:* More than half of the nonfatal, at-fault crashes of newly licensed 16-year-old drivers involved more than one contributing factor including speed, loss of control, and slippery roads. Efforts to reduce teenage crashes should focus on these factors.

Keywords: teenage drivers; novice drivers; teenage crashes; and teenage crash factors

1. Introduction

Teenage drivers have elevated crash rates compared with older, more experienced drivers. During 2000–01 the rate of crashes per million miles traveled for drivers ages 16–19 was four times the rate for drivers 20 and older combined. Among teenage drivers, crash rates were highest for 16 year-olds — 26 crashes per million miles traveled compared with 21, 15, and 14 per million for 17, 18, and 19 year-olds, respectively (Insurance Institute for Highway Safety [IIHS], 2006a). The elevated crash rate for young novice drivers is attributable to both their youthful age (manifested, for example, in a propensity for risk taking) and driving inexperience (Mayhew, Simpson, & Pak, 2003).

Extensive research has focused on identifying the high-risk situations that lead to novice drivers' crashes, especially fatal crashes. Driving at night and carrying teenage passengers elevate the risk of both injury crashes (Rice, Peek–Asa, & Kraus, 2003) and fatal crashes (Chen, Baker, Braver, & Li, 2000; Williams, Ferguson, & Wells, 2005; Ulmer, Williams, & Preusser, 1997), especially among 16-year-old drivers. Traveling faster than posted speed limits or driving too fast for conditions also contribute to fatal crashes involving 16-year-old drivers (Gonzales, Dickinson, DiGuiseppi, & Lowenstein, 2005; Williams, Preusser, & Ferguson, 1998; Williams, Preusser, Ulmer, & Weinstein, 1995). Compared with crashes involving older drivers, 16-year-old drivers are more likely to be involved in single-vehicle fatal crashes (Gonzales et al., 2005; Williams et al., 1995; Ulmer et al., 1997), and fatal crashes of 16–19-year-old drivers occur more frequently on wet or slippery roads (Marmor & Marmor, 2006). However, there has been little research focusing on novice drivers' nonfatal crashes. McKnight and McKnight (2003) found that in nonfatal police-reported crashes, 16–17-year-old drivers were more likely than 18–19-year-old drivers not to scan an intersection

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doi:10.1016/j.jsr.2007.12.002

adequately prior to making a left turn, but less likely to follow too closely or drive under the influence of alcohol. Laapotti et al. (2006) found that slippery road conditions were overrepresented in young male drivers' self-reported crashes of all severities relative to fatal crashes reported to insurers.

Graduated driver licensing is designed to address some of the excess risk of novice drivers by phasing in higher-risk driving privileges as beginners gain more experience. Although every U.S. state and the District of Columbia have some elements of graduated licensing, only 28 states plus the District of Columbia have laws rated good by IIHS (2006b). In states that have adopted graduated licensing laws, crashes among 16-year-old drivers have been reduced by 10–30% (Fohr, Layde, & Guse, 2005; Foss, Feaganes, & Rodgman, 2001; Governor's Highway Safety Office, 2001; Rice, Peek–Asa, & Kraus, 2004; Shope & Molnar, 2004; Ulmer, Preusser, Williams, Ferguson, & Farmer, 2000; Zwicker, Williams, Chaudhary, & Farmer, 2006).

Teenagers' risk of crashing is particularly high immediately after licensure. In a study of self-reported crashes during teenagers' first year of licensing, McCartt, Shabanova, and Leaf (2003) found that the rate of crashes per mile traveled was highest for the first month of licensure and declined substantially during subsequent months — from 2.3 to 1.1 to less than 0.5 crashes per 10,000 miles traveled for months 1, 2, and 11, respectively. Similarly, Mayhew et al. (2003) examined novice drivers' crashes per licensed driver and found that crash rates were highest for the first month after licensure, dropped dramatically and consistently through the 7th month, then declined more gradually through the 24th month. Driving inexperience and immaturity presumably underlie many of the crashes of novice teenage drivers, but little is known about the circumstances leading to the crashes. The present study was conducted to explore this issue. Nonfatal police-reported crashes involving newly licensed 16 year-olds in Connecticut were examined to identify the circumstances of the crashes and the factors that led to the crashes. Crashes in which teenage drivers were at fault were the primary focus.

2. Methods

Connecticut's driver licensing laws during the study period are summarized in Table 1. A learner's permit can be obtained at age 16 and a driver's license at either 16 years, 4 months if driver education through a commercial or secondary school is completed, or 16 years, 6 months with home-based driver education. Focusing on crashes of 16-year-old drivers ensured that crashes occurred within 8 months of licensure.

All crashes involving fatalities or injuries, and crashes occurring on public roads involving property damage in excess of $1000, must be reported to the Connecticut Department of Transportation. Police reports were obtained for all nonfatal crashes that occurred between March 2005 and February 2006, involved 16-year-old drivers, and were submitted within 12 weeks of the crash. From the names and addresses indicated on the reports, phone numbers were obtained using Internet telephone book searches. Parents for whom phone numbers were determined were contacted and asked permission for their teenagers to participate in a structured telephone interview about the circumstances of their crashes. All interviews were conducted within 4–17 weeks of the crash (median = 9 weeks) and were audiotaped and transcribed. Teenagers completing the telephone interview were mailed $10 for their participation. The crashes of the teenage drivers who were interviewed were the basis of the study.

Table 1
Provisions of connecticut's driver licensing laws during study period (March 2005–February 2006)

Learner's permit	Available at 16 or older after passing written test
	Only supervised driving allowed
	Must complete at least 20 hours of supervised driving*
	Cell phone use when driving prohibited*
Driver's license	Completion of driver education required; license available at 16 or older after holding learner's permit 6 months if completed driver education home training or 4 months if completed driver education through commercial or secondary school
	Passage of on-road driving test required
	Driving between midnight and 5:00 a.m. prohibited until age 18, unless traveling for employment, school, religious activity, or medical emergency, or assigned driver in Safe Ride program*
	Driving with passengers other than parents or supervising driver prohibited during first 3 months; driving with passengers other than members of immediate family prohibited during following 3 months*
	Cell phone use when driving prohibited until age 18*

*Effective October 1, 2005.

All crashes, including those for interviewed and for noninterviewed drivers, were categorized from the police reports using an approach based on the driver actions and vehicle movements that occurred immediately prior to and that led to the crash (McCartt, Shabanova Northrup, & Retting, 2004; Retting, Williams, Preusser, & Weinstein, 1995) (Table 2). Each crash was coded by two researchers, with an interrater reliability of 90%. Disagreements were resolved through discussion.

On each crash report, police identify a single contributing factor (e.g., driving on wrong side of road) and assign it to one of the drivers involved in the crash. A contributing factor was not assigned on a few reports, but in these cases a warning or citation usually was issued to one of the drivers. Assignment of contributing factors and other information on police crash reports were the basis for determining fault for the analyses comparing interviewed and noninterviewed drivers. For the main analyses involving only interviewed drivers, determination of fault also took into account information obtained from the telephone interviews. In almost all cases the determination of fault matched the assignment of the contributing factor on the police report.

Based on the interviews of at-fault drivers as well as information from police crash reports, a list of factors that contributed to the crashes was developed (Table 3). The factors were adapted from Snyder and Knoblauch (1971).

Table 2
Crash Types

Driver Action	Description
Violated right-of-way	Vehicle strikes another vehicle that has right-of-way; generally occurs at intersection
Rear end	Front of vehicle hits the rear of another vehicle traveling in the same direction
Ran off road	Vehicle leaves roadway
Changed lanes	Vehicle in a travel lane swerves or moves into another same-direction travel lane that already is occupied
Backed into travel lane	Vehicle backs up into or within travel lane and collides with another vehicle
Turned too wide/ narrow	Vehicle leaves intended travel lane while turning left or right at an intersection
Crossed into oncoming traffic	Vehicle crosses yellow line into oncoming traffic
Hit roadway obstacle	Vehicle strikes object in travel lane
Parking-related	Crash occurs while vehicle is moving into, out of, or within on-street parking
Other	Other driver action leads to crash
Unknown	Driver action leading to crash is unknown

Several factors had subcategories. For example, search and detection factors resulted from drivers: (a) not looking or not looking thoroughly; (b) not seeing due to distraction; (c) not seeing due to inattention; and (d) not seeing due to a physical obstruction, curve, hill, sun glare, or blind spot. No limit was set on the number of factors assigned to a crash, but only one subcategory within a factor was selected because the subcategories generally were mutually exclusive. For all crashes involving at-fault drivers, the factor determined to be the most important in contributing to the crash was identified as primary. Contributing factors were coded by two researchers, with an interrater reliability for primary factors of 86%. Disagreements were resolved through discussion.

Interview participation rates were examined for at-fault and not-at-fault drivers and by driver gender, crash severity, and crash type. For drivers who were interviewed, crash type and other crash characteristics were examined for at-fault and not-at-fault drivers. For at-fault drivers, contributing factors were examined by gender and crash type. For all analyses, tests of statistical significance were conducted using the chi-square statistic ($p<0.05$).

3. Results

Police crash reports were obtained for 893 nonfatal crashes involving 16-year-old drivers and occurring between March 2005 and February 2006 (Table 4). Phone numbers were obtained for 715 teenage drivers (80%), of whom 260 drivers (38%) were interviewed, 175 drivers (24%) declined to participate, and 278 drivers (39%) could not be reached for initial contact by phone within 10 weeks of the crash. There was no significant difference in participation rates between at-fault and not-at-fault drivers ($\chi^2(3)=5.5$, $p=0.14$). There also were no significant differences between interviewed and noninterviewed drivers with regard to gender ($\chi^2(1)=0.2$, $p=0.64$) or crash severity (injury vs. property damage only) ($\chi^2(1)=2.8$, $p=0.09$), but there was with regard to crash type ($\chi^2(11)=20.3$, $p=0.04$). The crashes of interviewed drivers compared with noninterviewed drivers more often were rear end (35% vs. 29%) and ran off road (30% vs. 25%) and less often "other" crash types such as turned too wide/narrow (3% vs. 1%). The crashes of interviewed drivers were more likely to occur during winter (December through February) than were crashes of noninterviewed drivers (31% vs. 22%, respectively) ($\chi^2(1)=8.4$, $p<0.01$).

3.1. Characteristics of Interviewed Drivers' Crashes

Of the 260 crash-involved teenage drivers interviewed, 69% were involved in multiple-vehicle crashes. Teenage drivers were at-fault in 68% of multiple-vehicle crashes and 95% of single-vehicle crashes; these at-fault teenagers represented 76% of the interviewed drivers. Based on police crash reports, 40% of at-fault drivers received tickets, 30% received written warnings, and 24% received verbal warnings. Characteristics of the crashes of interviewed drivers are

Table 3
Factors contributing to crashes

Driver factors	Course: Illegally deviated from traffic rules or normal traffic patterns, generally high risk in nature ●Drifted out of lane ●Passed improperly ●Intentionally disregarded traffic signal or stop sign ●Other Search and detection: Failed to see or detect other vehicle or traffic control device ●Did not look, did not look thoroughly, or looked in wrong direction ●Driver was distracted by secondary task (e.g., tuning radio) ●Driver was inattentive (e.g., daydreaming) ●Physical obstruction (e.g., parked car), curved roadway, hill, sun glare, or other vehicle in driver's blind spot Evaluation: Misjudged other vehicle or driving environment ●Followed too closely ●Misjudged speed or direction of other vehicle ●Misunderstood right-of-way ●Other Speeding ●Traveled too fast for conditions ●Exceeded speed limit Swerved to avoid animal or vehicle Driver impairment ●Fatigued or asleep ●Impaired by alcohol Lost control or slid, due to overcorrection, slick roadway, or other reason Vehicle mishandling (e.g., foot slipped from brake, put vehicle in wrong gear) Caravanning with other teenager(s) Other
Nondriver factors	Slippery roadway Unfamiliar vehicle Unfamiliar roadway Vehicle failure (e.g., brakes or tires failed)
Unknown	

Table 4
Percent distribution of attempted contact for drivers for whom crash reports were obtained for at-fault and not-at-fault teenage drivers

	At-fault (n=651)	Not-at-fault (n=242)	Total (n=893)
Interviewed	28	33	29
Could not obtain phone number	21	18	20
Unable to reach within 10 weeks of crash	33	27	31
Declined to be interviewed	19	22	20
Total	100	100	100

described below. Differences between at-fault and not-at-fault drivers are indicated only when these differences were statistically significant.

Fifty-one percent of interviewed drivers were male. Twenty-two percent of drivers had had at least one prior crash. Twenty percent of crashes of interviewed drivers involved nonfatal injuries, and 80% involved property damage only. Based on police crash reports, 69% of the injury crashes involved complaints of injury, 29% involved visible injuries, and 2% involved severe injuries. Sixty-eight percent of crashes occurred during daylight hours, 36% occurred on slippery roads (e.g., wet, sandy, icy), and 45% occurred at intersections.

Most crashes of interviewed drivers occurred on Fridays or Saturdays (18% each), and the fewest crashes occurred on Mondays (11%). Eighteen percent of crashes occurred between 6 a.m. and noon, 48% between noon and 6 p.m., 31% between 6 p.m. and midnight, and 13% between midnight and 6 a.m.

Based on teenagers' interviews, 66% of crashes occurred within 5 miles of teenagers' homes; only 1% occurred more than 20 miles from home. The most common reason for teenagers' trips was driving somewhere to socialize with friends or family (29%). Other reasons included traveling to school or school-related events (19%), work (15%), shopping (9%), or sports or extracurricular activities (7%). None of the crashes of not-at-fault drivers occurred on curved roads, compared with 23 of crashes of at-fault drivers, a significant difference ($\chi^2(2)=17.5$, $p<0.001$). Twenty-three percent of at-fault drivers reported being distracted prior to the crash, compared with 3% of not-at-fault drivers, also a significant difference ($\chi^2(2)=12.2$, $p=0.002$). Two percent of drivers were using cellphones at the time of the crash. Twenty-three percent of drivers had at least one teenage passenger in the vehicle at the time of the crash, 80% of whom were neither siblings nor relatives.

3.2. Types of Interviewed Drivers' Crashes

Three crash types accounted for 88% of the crashes of interviewed drivers — rear end (35%), ran off road (30%), and violated right-of-way (23%) (Table 5). All other crash types were combined as other (11%) or unknown (1%). The distribution of crash types differed significantly between at-fault and not-at-fault drivers ($\chi^2(8)=38.7$, $p<0.001$). At-fault drivers, the primary focus of the study, were involved most often in ran-off-road crashes (39%) followed by rear-end (31%) and violated right-of-way (20%) crashes. Not-at-fault drivers were involved most often in rear-end crashes (i.e., they were rear ended by another vehicle) (51%), followed by violated right-of-way crashes (i.e., they had the right-of-way) (29%).

3.3. Contributing Factors in At-Fault Drivers' Crashes

Of the 198 crashes involving at-fault teenage drivers, 42% had one contributing factor, 23% had two factors, and 34% had three or more factors. The most common contributing factors were search and detection (39%), speeding (38%), lost control/slid (38%), slippery roadway (30%), evaluation (19%), and course (10%) (Table 6).

Subcategories of search and detection factors included drivers not looking thoroughly (15% of all at-fault drivers), distraction (12%), inattention (7%), and obstructed view (6%). The types of distractions were studied in more detail (table not shown). Most of the distractions occurred inside the vehicle and resulted from drivers adjusting the radio or CD player (25% of distractions), interacting with pets (8%) or friends (4%), or talking on cell phones (4%). All other in-vehicle distractions (e.g., watching an insect, cleaning the windshield, opening a window to throw out trash) accounted for 33% of all distractions. Things outside the vehicle (e.g., street signs, a child running into the street, police activity) accounted for 12% of distractions, and drivers watching something in the vehicle's side- or rear-view mirrors accounted for another 12%.

Speeding factors included teenagers driving too fast for conditions (21% of all at-fault crashes) and exceeding posted speed limits (12%). However, exceeding the speed limit was coded as a factor only when this was specifically indicated on police crash reports or during interviews. So it is likely that additional teenagers were, in fact, speeding when their crashes occurred. Of the crashes involving speeding, 83% also involved the driver losing control of the vehicle or sliding, and 75% occurred on slippery roads.

Among all the crashes of at-fault divers, 21% involved a combination of speeding and losing control or sliding on a slippery road. Speeding also was a contributing factor in 16% of crashes involving search and detection factors. No

Table 5
Percent Distribution of Crash Types for At-fault and Not-At-Fault Teenage Drivers

	At-fault (n=198)	Not-at-fault (n=59)	Total* (n=260)
Violated right-of-way	20	29	23
Rear end	31	51	35
Ran off road	39	0	30
Other	9	19	11
Unknown	1	2	1
Total	100	100	100

*Includes three cases where fault was unknown.

Table 6
Percent distribution of contributing factors in at-fault drivers' crashes

	Percent (n=198)
Driver factors	
Course	
Drifted out of lane	5
Passed improperly	3
Intentionally disregarded traffic signal or stop sign	2
Other course error	1
Total	10
Search and detection	
Did not look, did not look thoroughly, or looked in wrong directions	15
Driver was distracted	12
Driver was inattentive	7
Physical obstruction, curved road, hill, sun glare, or blind spot	6
Total	39
Evaluation	
Followed too closely	10
Misjudged speed or direction of other vehicle	7
Misunderstood right-of-way	2
Other	<1
Total	19
Speeding	
Too fast for conditions	26
Exceeding speed limit	12
Total	38
Swerved to avoid animal or vehicle	7
Driver impairment	
Fatigued or asleep	3
Impaired by alcohol	<1
Total	4
Lost control or slid	38
Vehicle mishandling	3
Caravanning with other teenager(s)	1
Other	2
Nondriver factors	
Slippery roadway	30
Unfamiliar vehicle	4
Unfamiliar roadway	4
Vehicle failure	3
Unknown	3

Note: Percents sum to greater than 100 because multiple factors could be coded per crash.

other substantial relationships among contributing factors were found.

3.4. Contributing Factors by Crash Type

Factors contributing to at-fault drivers' crashes were examined by crash types (Table 7). For ran-off-road crashes the most common factors were lost control/slid (86%), speeding (76%), and slippery roadway (51%). For violated right-of-way crashes, the most common factors were search and detection (60%) and evaluation (35%). For rear-end crashes, the most common factors were search and detection (55%), evaluation (32%), slippery roadway (21%), and speeding (19%).

3.5. Primary Contributing Factors

A primary contributing factor was identified for at-fault crashes. The most common primary factors were search and detection (35%) followed by speeding (28%), evaluation (17%), and lost control/slid (8%). The remaining factors each represented 5% or less of the crashes. There was little difference between the distributions of all contributing factors and primary factors, with the exception of lost control/slid. For crashes involving both speeding and lost control/slid factors, consistent judgments were made that speeding was the primary factor, largely because it preceded the loss of control or sliding.

3.6. Crash Types and Contributing Factors by Gender

Although there was no significant difference in the distribution of crash types when examined by gender ($\chi^2(4)=8.7$, $p=0.07$), male drivers were more likely than female drivers to be involved in ran-off-road crashes (45% vs. 33%), whereas female drivers were more likely than male drivers to be involved in rear-end crashes (35% vs. 28%) or violated right-of-way crashes (26% vs. 15%).

In terms of contributing factors, male drivers were significantly more likely than female drivers to speed (48% vs. 26%; $\chi^2(1)=10.2$, $p=0.001$) or lose control of their vehicles or slide (46% vs. 29%; $\chi^2(1)=5.9$, $p=0.02$). Female drivers were significantly more likely than male drivers to fail to detect another vehicle or traffic control (48% vs. 32%; $\chi^2(1)=5.1$, $p=0.02$).

Table 7
Percent Distribution of Contributing Factors in At-Fault Drivers' Crashes by Crash Type

	Violated right-of-way (n=40)	Rear end (n=62)	Ran off road (n=78)	Other (n=18)
Driver factors				
Course	2	2	13	44
Search and detection	60	55	17	39
Evaluation	35	32	0	17
Speeding	2	19	76	17
Swerved to avoid animal or vehicle	0	0	17	0
Driver impairment	0	5	5	0
Lost control or slid	0	11	86	11
Vehicle mishandling	2	5	0	6
Caravanning with other teenager(s)	2	2	0	0
Other	2	0	0	0
Nondriver factors				
Slippery roadway	5	21	51	28
Unfamiliar vehicle	0	0	6	11
Unfamiliar roadway	12	0	4	0
Vehicle failure	0	2	4	6
Unknown	8	0	1	0

Note: Percents sum to greater than 100 because multiple factors could be coded per crash.

4. Discussion

The present study adds to limited research on nonfatal crashes of newly licensed teenagers. Three-fourths of the teenagers involved in crashes were at fault, and 70% of the collisions of at-fault drivers were ran-off-road or rear-end crashes. There was a significant difference in crash type between interviewed and noninterviewed drivers. However, it is unlikely this biased the results because the three main crash types differed by 6% or less.

About 60% of at-fault drivers' crashes involved more than one contributing factor, and most factors were related to driver behavior rather than to the vehicle or roadway. Three driver behaviors contributed about equally to crashes: failing to detect another vehicle or traffic control, speeding, and losing control of the vehicle or sliding. Slippery roads also were an important factor. Although the study period covered one full year (March 2005–February 2006), interviewed drivers were more likely to crash during winter months (31% vs. 22%, respectively.) The difference was statistically significant but not large. It is unlikely this biased the findings substantially because there was no significant difference in slippery road conditions, as coded on police crash reports, between interviewed and noninterviewed drivers.

Most of the police-reported crashes in the present study did not involve injuries, and there were no significant differences between crashes involving injury and those with property damage only in terms of drivers' speeding or alalcohol impairment, or nighttime occurrence. So it is not surprising that some of the crash characteristics (e.g., time of day, extent of alcohol impairment) differed from those of fatal crashes involving teenage drivers (Gonzales et al., 2005; Williams et al., 2005). Still, some factors were similar. Speeding and traveling too fast for conditions have been associated with fatal crashes involving 16-year-old drivers (Gonzales et al., 2005; Williams et al., 1995; Williams et al., 2005). The present study as well as prior research (McKnight & McKnight, 2003) also have found that traveling too fast for conditions is a factor in teenagers' nonfatal crashes, as are slippery roads and drivers' failure to see another vehicle.

As with the present study McKnight and McKnight (2003) found that, among teenage drivers, males were more likely than females to crash due to speeding and losing control of the vehicle; whereas females were more likely to violate the right-of-way because they failed to see the other vehicle or traffic control. Male drivers of all ages, but particularly young males, are more likely than female drivers of the same age to speed (Kostyniuk, Molnar, & Eby, 1996; Laapotti & Keskinen, 1998; Simons–Morton, Lerner, & Singer, 2005) or follow too closely (Evans & Wasielewski, 1983; Kostyniuk et al., 1996; Simons–Morton et al., 2005).

Rather than relying solely on police crash reports (McKnight & McKnight, 2003) or drivers' self-reports (Laapotti et al., 2006), the present study used both sources. This allowed crash factors to be identified more completely because Connecticut police crash reports code only one contributing factor for an at-fault driver. Drivers were interviewed within a few weeks of their crashes, which should have ensured good recall of events. The interview data were particularly useful when examining search and detection factors, and these factors were found to commonly involve distraction, inattention, or not looking thoroughly. Prior research has found that young drivers are more prone to distraction than older drivers (McKnight & McKnight, 1993) and are less efficient in processing the visual information needed to drive safely while engaging in other nondriving tasks (Mourant & Rockwell, 1972; Summala, 1996).

Some of the factors contributing to a large proportion of novice teenage drivers' crashes (e.g., difficulty navigating slippery roads, not looking thoroughly at other vehicles or traffic controls) point to the importance of teenagers obtaining adequate amounts of practice driving in a variety of situations. As of January 2008, 40 U.S. states and the District of Columbia have enacted laws requiring parental certification of a minimum number of hours of supervised driving prior to licensure; 32 states and the District of Columbia require that some of this driving occur at night. One state, Alaska, requires that some practice driving occur in inclement weather or at night (IIHS, 2006b). Since October 1, 2005, Connecticut has required at least 20 hours of supervised driving. During the interview drivers were not asked how many supervised hours of driving they obtained prior to licensure.

To reduce distracted driving among novice teenage drivers, 17 states and the District of Columbia prohibit the use of cellular phones by young drivers under the provisions of graduated licensing (IIHS, 2006c). Six states and the District of Columbia have enacted a jurisdiction-wide ban on driving while talking on a handheld cellular telephone (IIHS, 2006c). In the present study talking on cell phones contributed to only 1% of at-fault drivers' crashes. The state law banning drivers younger than 18 from talking on cell phones became effective during the study period and was in force when almost half of the crashes occurred. Cell phone use contributed to only 1% of at-fault crashes both before and after the law went into effect, and the relative importance of cell phone use before and after the ban could not be assessed because of the small sample sizes.

The behavioral and crash effects of cell phone restrictions and minimum practice driving requirements on novice teenage drivers' crashes are unknown. One study found that graduated licensing programs that include a minimum 3-month learner's permit holding period, a nighttime driving restriction after licensure, and either 30 hours or more of supervised driving or a passenger restriction were associated with a 16–21% reduction in fatal crashes involving 16-year-old drivers (Chen, Baker, & Li, 2006). Although many people believe driver education can reduce crashes involving teenage novice drivers, studies of these programs have found no significant safety benefits (Mayhew, Simpson, Williams, & Ferguson, 1998).

Regardless of practice driving or driver education requirements, parents will remain primarily responsible for the amount and types of supervised driving their teenagers obtain and for monitoring their driving after licensure. In a recent survey of parents of newly licensed teenagers, virtually all parents said they plan to supervise their teenagers' driving (McCartt, Hellinga, & Haire, 2007). When not accompanying their teenagers in the vehicles, parents most wanted to know whether their teenagers were speeding or distracted — behaviors that emerged as important crash factors in the present study. In-vehicle monitoring devices such as video cameras and global positioning systems are being developed to provide feedback to parents and/or teenagers on teenagers' risky driving behaviors (e.g., speeding, hard braking). This feedback may help beginning drivers learn some important driving skills (e.g., safe speeds, braking, following distance) sooner than they would otherwise. Among the parents surveyed, the proportion who would consider using these devices ranged from 32% for video cameras to 51% for computer chips that record trip data.

In the long term, crash avoidance systems may be beneficial in preventing teenage drivers' crashes. In the present study, ran-off-road crashes were the most common type of collision involving at-fault drivers. Electronic stability control (ESC) has been found to reduce single-vehicle crashes by 41% and is particularly effective in preventing collisions on wet roads or curves (Farmer, 2006), both of which were common crash factors in this study. The effects on crashes of other crash avoidance systems such as lane departure warning systems have not been evaluated.

Acknowledgment

This work was supported by the Insurance Institute for Highway Safety.

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