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Characteristics of Single Vehicle Crashes with a Teen Driver in South Carolina, 2005–2008

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Abstract

Objective—Teens' crash risk is highest in the first years of independent driving. Circumstances surrounding fatal crashes have been widely documented, but less is known about factors related to nonfatal teen driver crashes. This study describes single vehicle nonfatal crashes involving the youngest teen drivers (15–17 years), compares these crashes to single vehicle nonfatal crashes among adult drivers (35–44 years) and examines factors related to nonfatal injury producing crashes for teen drivers.

Methods—Police crash data linked to hospital inpatient and emergency department data for 2005–2008 from the South Carolina Crash Outcomes Data Evaluation System (CODES) were analyzed. Nonfatal, single vehicle crashes involving passenger vehicles occurring on public roadways for teen (15–17 years) drivers were compared with those for adult (35–44 years) drivers on temporal patterns and crash risk factors per licensed driver and per vehicle miles traveled. Vehicle miles traveled by age group was estimated using data from the 2009 National Household Travel Survey. Multivariable log-linear regression analysis was conducted for teen driver crashes to determine which characteristics were related to crashes resulting in a minor/moderate injury or serious injury to at least one vehicle occupant.

Results—Compared with adult drivers, teen drivers in South Carolina had 2.5 times the single vehicle nonfatal crash rate per licensed driver and 11 times the rate per vehicle mile traveled. Teen drivers were nearly twice as likely to be speeding at the time of the crash compared with adult drivers. Teen driver crashes per licensed driver were highest during the afternoon hours of 3:00–

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5:59 pm and crashes per mile driven were highest during the nighttime hours of 9:00–11:59 pm. In 66% of the teen driver crashes, the driver was the only occupant. Crashes were twice as likely to result in serious injury when teen passengers were present than when the teen driver was alone. When teen drivers crashed while transporting teen passengers, the passengers were >5 times more likely to all be restrained if the teen driver was restrained. Crashes in which the teen driver was unrestrained were 80% more likely to result in minor/moderate injury and 6 times more likely to result in serious injury compared with crashes in which the teen driver was restrained.

Conclusions—Despite the reductions in teen driver crashes associated with Graduated Driver Licensing (GDL), South Carolina's teen driver crash rates remain substantially higher than those for adult drivers. Established risk factors for fatal teen driver crashes, including restraint nonuse, transporting teen passengers, and speeding also increase the risk of nonfatal injury in single vehicle crashes. As South Carolina examines strategies to further reduce teen driver crashes and associated injuries, the state could consider updating its GDL passenger restriction to either none or one passenger < 21 years and dropping the passenger restriction exemption for trips to and from school. Surveillance systems such as CODES that link crash data with health outcome data provide needed information to more fully understand the circumstances and consequences of teen driver nonfatal crashes and evaluate the effectiveness of strategies to improve teen driver safety.

Keywords

Teen driving; Motor vehicle crashes; Graduated driver licensing; Speeding; Seat belt use; CODES

1. Introduction

Learning to drive is an important rite of passage for most adolescents in the United States. During 2012–2013, 77% of high school seniors reported driving during an average week (Shults et al., 2016). Teens' crash risk is highest in the first years of independent driving (Chapman et al., 2014; Curry et al., 2015; Foss et al., 2011). Per mile driven, 16–17 year-old drivers are involved in fatal crashes at nearly twice the rate of 18–19 year-old drivers (IIHS, 2016). In 2014, 1794 teens ages 16–19 years died in passenger vehicle crashes; 60% of the fatally injured teens were driving at the time of the crash. Among all passengers ages 16–19 years who died in crashes, over half were riding with a teen driver (IIHS, 2016).

Factors that contribute to crashes among novice teen drivers include inexperience, nighttime driving, teen passengers, speeding or driving too fast for conditions, inadequate surveillance of surroundings, and to a lesser extent, alcohol consumption, (Curry et al., 2011; Ferguson 2013; Ouimet et al., 2015; Williams 2003). To help reduce crash risk for novice teen drivers, every state and the District of Columbia has implemented some form of a graduated driver licensing system (GDL); the included components and timeline for progressing through the GDL stages vary from state-to-state. GDL allows novice teen drivers to gain independent driving experience while limiting risk factors such as nighttime driving and teen passengers. GDL has been associated with reductions in crash risk of 20–40% for the youngest teen drivers (Shope, 2007).

Implemented in 2002, South Carolina's GDL specifies a minimum age for obtaining a beginner's permit of 15 years, 0 months (SCDMV, 2017; S.C. Code Ann, 2002). Teens with

a beginner's permit may drive only if an adult (≥ 21 years old) licensed driver is riding in the front seat with the teen. Teens must hold the permit for at least 6 months before being eligible for a conditional license. Teens with a conditional license may drive at night (6:00 pm–6:00 am (EST) or 8:00 pm–6:00 am (EDT)) only with an adult licensed driver in the vehicle and may not carry more than two passengers < 21 years old unless driving to and from school. The earliest age at which teens may obtain a regular license with no restrictions is 16 years, 6 months, and only if they have held the conditional license for 12 months without any Traffic offenses or at-fault crashes.

Teen driver crash risks have been identified primarily from studies examining fatal crashes; less is known about factors related to nonfatal crashes. The Crash Outcome Data Evaluation System (CODES) database links police crash reports to hospital and emergency department billing records, thereby providing an integrated source of information on risk factors for the crash, crash circumstances, and medical treatment of any resulting injuries. CODES was originally developed by the National Highway Traffic Safety Administration (NHTSA) to foster state-level linkage of police crash data to hospital discharge, emergency department, emergency medical services, and other data systems (Kindelberger and Milani, 2015). As part of an inter-agency collaboration, NHTSA brought the Centers for Disease Control and Prevention (CDC) and the South Carolina CODES project (housed at the South Carolina Revenue and Fiscal Affairs Office) together to explore the uses of linked data in an applied analysis. For this study, we analyzed South Carolina CODES data to describe single vehicle nonfatal crashes involving the youngest teen drivers (15–17 years), compared these crashes to single vehicle, nonfatal crashes among adult drivers (35–44 years) and examined factors related to injury producing crashes for teen drivers.

Material and methods

We analyzed 2005–2008 data (latest linked data available at time of analysis) from South Carolina CODES. The crash data, received from the South Carolina Department of Public Safety, represent every police-reported crash on a public road in the state that resulted in ≥ $500 damage. Hospital inpatient and emergency department uniform billing data are collected under §44-6-170, South Carolina Code of Laws, and maintained by the Health and Demographics section of the South Carolina Revenue and Fiscal Affairs Office. The South Carolina CODES project used a probabilistic, multiple imputation data linking methodology to link the crash data and the inpatient discharge and emergency department data using personal identifiers (e.g., name, date of birth, gender), event identifiers (e.g., date of crash, date of admission or visit), and geographic identifiers (e.g., county of crash, county of hospital) (Cook et al., 2015; McGlincy, 2004). The number of licensed drivers for 2005 was obtained from the South Carolina Department of Motor Vehicles (personal communication, Shirley Rivers, August 2016). For years 2006–2008, the number of licensed drivers was obtained from the annual South Carolina Traffic Collision Fact Books (SCDMV, 2006; SCDMV, 2007; SCDMV, 2008). The study was considered exempt by the CDC institutional review board.

The study included teen drivers ages 15–17 years, the ages that are generally subject to GDL in South Carolina, who were involved in a police-reported, nonfatal single vehicle crash of a

passenger vehicle (defined as passenger car, light truck, passenger van, or sport utility vehicle) on a public roadway in South Carolina from 2005 to 2008. Information about the crash circumstances included driver and passenger gender, age group, and restraint use; first harmful event; weather and lighting conditions; the primary contributing factor; and time of day and day of week. This information was collected at the crash scene by the investigating law enforcement officer. The study was limited to single vehicle crashes (14% of all teen driver crashes, 10% of all adult driver crashes) so that the primary contributing factor could be associated with the driver. Because this factor is assigned at the crash level, associating it with a particular driver in a multiple vehicle crash was not possible.

Injury severity was based on the Maximum Abbreviated Injury Scale (MAIS), calculated using patient age, primary diagnosis and up to nine secondary diagnoses, and was defined as “none” if no vehicle occupant was injured in the crash, as “minor/moderate” when the highest MAIS for any occupant was one or two, and as “serious” when the highest MAIS for any occupant was three to six (Zonfrillo et al., 2015).

We compared the crash circumstances involving teen drivers with those involving adult drivers ages 35–44 years. This adult age range was selected as a group with crash rates close to the average for all drivers (NHTSA, 2014). To explore the temporal patterns of teen driver crashes, we defined weekend to be from Friday at 6:00 pm to Sunday at 4:59 pm and afternoon rush hour as 3:00 pm to 5:59 pm on Monday–Friday. Weekend nights were defined as Friday at 6:00 pm to Saturday at 2:59 am and Saturday at 6:00 pm to Sunday at 2:59 am. Driver and passenger restraint use was recorded on the police crash report; 206 records (3%) with the seat belt use variable either missing or recorded as “unknown” were excluded from the analysis. Passenger status was defined as “driver only” when there was no passenger, as “teen-only passengers” when all passengers were from 15 to 20 years of age, as “adult passenger present” when at least one passenger 21 years of age or over was present, whether or not there were teen passengers, and as “other” when the passengers were either all 14 years of age or under or the passengers were a mix of teens and children. A crash was considered to involve speeding if its primary contributing factor was listed as either exceeding the speed limit or driving too fast for conditions. The first harmful event was categorized as non-collision event (e.g., rollover, ran off the road), collision with a fixed object, or collision with a non-fixed object or person.

To compare temporal patterns of teen driver crashes with those of adults, crashes for both groups were summarized by day of week and hour of day (in 3 hour increments hereafter referred to as “time of day”). Crashes by time of day for each day of the week were divided by licensed drivers to obtain a crash rate per licensed drivers for each time period. To examine the crash rate based on driving exposure, national data on the distribution of vehicle miles traveled (VMT) by day of the week and time of day for drivers ages 15–17 years and 35–44 years were obtained from the 2009 National Household Travel Survey (NHTS, 2011) and multiplied by the total annual South Carolina VMT for the respective age group to estimate the number of VMT by day of the week and time of day for each age group. The distribution of VMT from the NHTS was used because the VMT distribution for South Carolina had cell sizes too small to be stable. Because the percent of VMT for the hours of midnight to 5:59 am had sample sizes < 20 for some cells, these hours were excluded from

this analysis. Crash rates per one million VMT by day of week and time of day were estimated by dividing the crashes for each time period by four to obtain an annualized estimate and then dividing this result by the respective VMT estimate for the time period. After examining graphs of the rates, we combined Monday through Thursday because the patterns by time of day were similar. To further compare teen and adult driver crashes, percentages, rates per 10,000 licensed drivers, and p-values for selected characteristics were calculated.

Lastly, we conducted multivariable log-linear regression analysis for teen driver crashes to determine which characteristics were related to crashes resulting in a minor/moderate injury or serious injury. Crude risk ratios (RRs) were calculated first; any RR with a 95% confidence interval (CI) that did not contain 1.0 was carried forward into the multivariable analysis with the exception of gender, which was included in all multivariable analyses. All analyses were performed using SAS® v 9.3.

2. Results

During 2005–2008, 6451 passenger vehicle drivers ages 15–17 were involved in nonfatal single vehicle crashes on public roads in South Carolina, at a rate of 139 crashes/10,000 licensed drivers (Table 1). By year, teen drivers were in 1443 crashes in 2005, 1869 crashes in 2006, 1801 crashes in 2007, and 1337 crashes in 2008. Adult drivers, ages 35–44 years, were involved in 12,717 crashes, at a rate of 56 crashes/10,000 licensed drivers. By VMT, the teen driver crash rate was 11 times higher than the adult driver rate (3.2 crashes/million VMT versus 0.30 crashes/million VMT, respectively, data not shown).

In 66% of the teen driver crashes, the driver was the only occupant compared with 79% of the adult driver crashes. Twenty-eight percent of the teen driver crashes resulted in injury to at least one vehicle occupant compared with 22% of adult driver crashes. Driver restraint use was similar for teens (90%) and adults (91%). Teen drivers were ten times more likely than adult drivers to have teen-only passengers (22% versus 2%, respectively). Among teen drivers with passengers, males were more likely to have teen-only passengers compared with females (69% versus 60%, $p < .01$) (data not shown).

Teen drivers with teen-only passengers were less likely to use restraints (86%) compared with teens with no passengers (92%). In crashes in which a teen driver was transporting only teen passengers, we found a strong association between driver and passenger restraint usage; when the driver was restrained, all passengers were more than five times as likely to be restrained (92%) compared with passengers of unrestrained drivers (17%) (data not shown).

Speeding was the primary contributing factor in 60% of teen driver crashes compared with 33% of adult driver crashes. Speeding was involved in 59% of teen driver crashes with no passengers, 53% with at least one adult passenger and 65% with teen-only passengers ($p < .01$) (data not shown).

For teens, crash rates per licensed driver were highest during the afternoon hours of 3:00–5:59 pm on Sundays–Thursdays, with rates ranging from 4.4 to 4.5 crashes/10,000 licensed teen drivers (Fig. 1). On Fridays and Saturdays, crash rates per 10,000 licensed teen drivers

peaked during the periods of 3:00–5:59 pm (4.8 and 4.5, respectively) and 9:00–11:59 pm (4.4 and 4.7, respectively). Crash rates for adults were highest on Friday and Saturday nights from 9:00–11:59 pm, with rates of 1.7 and 1.8 crashes/10,000 licensed adult drivers, respectively.

Teen crash rates based on driving exposure revealed a different pattern (Fig. 2). Crash rates were highest during 9:00–11:59 pm on Mondays–Thursdays (5.6 crashes/million VMT) and Fridays (8.3 crashes/million VMT). Compared with weekday teen crash rates, Saturday and Sunday teen crash rates were more evenly distributed throughout daytime and nighttime hours. Crash rates for adults were highest during 9:00–11:59 pm on Sundays (2.6 crashes/million VMT) and Mondays–Thursdays (3.7 crashes/million VMT).

Among the 1825 injury producing teen driver crashes, 1070 (59%) involved a driver with no passengers (data not shown). Therefore, the driver had the most severe injury. The driver had either the most severe injury or an injury severity equal to that of the highest passenger injury severity in 60% of the 755 injury crashes with passengers and in 84% of the total injury crashes (data not shown).

The multivariable analysis indicated that male teen driver crashes were 20% less likely to result in a minor/moderate injury to at least one occupant compared with female driver crashes and equally likely to result in serious injury, when controlling for other variables (Table 2). Unrestrained driver crashes were 80% more likely to result in a minor/moderate injury to at least one occupant and 600% more likely to result in serious injury compared with restrained driver crashes.

Teen passenger-only crashes were 30% more likely to result in minor/moderate injury and 100% more likely to result in serious injury compared with no passenger crashes. Crashes in which the first harmful event was a collision were 40% to 80% more likely to result in a minor/moderate injury than when the first harmful event was not a collision. Crashes with speeding as the primary contributing factor were 70% more likely to result in serious injury compared with crashes in which speeding was not the primary contributing factor.

3. Discussion

This study found that, compared with adult drivers ages 35–44, teen drivers ages 15–17 in South Carolina had 2.5 times the single vehicle nonfatal crash rate per licensed driver and 11 times the rate per vehicle mile traveled. McCartt and Teoh (2015) reported similar findings for the nation; rates of police-reported crashes of all severities in 2008 for 16- and 17-year-old drivers (31 and 21 per million VMT, respectively) were substantially higher than rates for drivers ages 30–59 years (3 per million VMT). Differences in adult and teen driving patterns may partially explain differences in crash rates. For example, in South Carolina, 54% of miles driven by adults and 33% miles driven by teens in 2009 occurred on interstate highways (NHTS, 2011), which have substantially lower fatal crash risk per VMT compared with other roads (Federal Highway Administration, 2016).

Our results suggest that when teen drivers transport only teen passengers, the drivers' restraint use may strongly influence passenger restraint use; all passengers were > 5 times as

likely to be restrained in a crash if the teen driver was restrained. The multivariable analysis of teen driver crashes illustrated the consequence of not being belted; crashes in which the driver was not belted were 6 times more likely to result in a serious injury to at least one person in the vehicle.

Sixty percent of teen driver crashes involved speeding. This high occurrence of speeding-related teen driver crashes is likely due in part to the study being restricted to single vehicle crashes. In a separate study, Carney et al. (2015) found that 80% of teen driver single vehicle crashes and < 2% of multiple vehicle crashes involved driving too fast. Nonetheless, we found that teen drivers were cited as speeding at the time of the crash nearly twice as frequently as adult drivers. Reducing speeding among teen drivers presents unique challenges, in part because the behavior is common and viewed as generally acceptable by drivers of all ages (Ferguson, 2013).

For this study, speeding was defined as either exceeding the posted speed limit or driving too fast for conditions. The context surrounding the two categories of speeding may differ and therefore, reducing their occurrence may require different approaches (Curry et al., 2011; Ferguson, 2013; Williams, 2006). Exceeding the posted speed limit may be an intentional behavior, whereas driving too fast for conditions could reflect a lack of recognition of potential hazards related to inexperience. For example, Braitman et al. (2008) reported that 75% of speeding-related crashes among newly licensed teen drivers occurred on slippery roads, suggesting the need for teens to obtain adequate amounts of practice driving under various driving conditions. In contrast, multiple studies have documented teens' propensity to exceed the speed limit. For example, Klauer et al. (2011) reported that newly licensed teens with ≥ 7 months driving experience were more likely than their parents to exceed the posted speed limit by > 10 miles per hour. Teens also sped more frequently when driving at night or with passengers, potentially compounding crash risk. A separate study of teen drivers as they left high school parking lots concluded that overall, teens drove slightly faster than general Traffic, and males drove much faster when they were transporting a male teen passenger (Simons-Morton et al., 2005).

In-vehicle technologies to monitor speeding, nonuse of seat belts and other risky driving behaviors are commercially available. Several evaluations of interventions that employed these devices as part of parental monitoring programs suggest that they can be effective in reducing risky driving among newly licensed teens (Carney et al., 2010; Farah et al., 2014; Farmer et al., 2010; Simons-Morton et al., 2013). However, when surveyed some parents voiced reluctance to use monitoring devices because of concerns about violating their teens' trust and cost (Guttman and Lotan, 2011; McCartt et al., 2007). In-vehicle monitoring might provide added protection for newly licensed teens who demonstrate a risky driving style by involvement in at-fault crashes or receiving certain moving violations (Farmer et al., 2010).

Teen driver crashes per licensed driver peaked during the afternoon school commute hours of 3:00–5:59 pm (Williams, 2003). South Carolina's GDL allows teen drivers holding a conditional license to carry up to two passengers < 21 years old and lifts this restriction for trips to and from school. Our findings indicated that transporting teen-only passengers doubled the risk of a crash resulting in a serious injury compared with driving alone. As of

July 2017, 44 states and the District of Columbia restrict the number of young passengers that a newly licensed driver can transport to either none or one (IIHS, 2017). Multiple studies have documented the effectiveness of these restrictions in reducing fatal and nonfatal crashes (Masten et al., 2013; Trempel, 2009; Vanlaar et al., 2009). As South Carolina examines strategies to further reduce teen driver crashes and associated injuries, the state could consider updating its GDL passenger restriction to either none or one passenger < 21 years and dropping the passenger restriction exemption for trips to and from school (CDC, 2016; Mayhew et al., 2014).

This study has important limitations. The most current available crash data were from 2005 to 2008. However, South Carolina's GDL has not changed since 2002, so teens during the study period were obtaining licenses under the same requirements as current teens. Because we examined only police-reported crashes that resulted in ≥$500 damage, less severe crashes and unreported crashes were excluded. Therefore, our findings of the circumstances surrounding crashes and resulting injuries may not be representative of all teen driver single vehicle crashes in South Carolina. Neither licensure status for adults or teens nor the type of license (beginner's permit, conditional, full) held by teens was available. Additionally, we could not separately examine teen crash rates by the driver's year of age. Both driving exposure and crash risk vary by year of age (Foss and Williams, 2015). Our driving exposure information was estimated using national data and lacked information on passenger status. Information about the crash circumstances was collected solely from the police reports and, therefore, was not validated. Previous studies have found that police misclassification of seat belt use occurs more commonly among uninjured occupants compared with fatally or non-fatally injured occupants (Cummings, 2002; Schiff and Cummings, 2004). If driver restraint use was overestimated for non-injury crashes in this study, the relative risk estimates for injury crashes by driver restraint use could be biased upward. Because driver alcohol or drug use data were either missing or results were unknown for 98% of teen drivers, substance use was not considered in the study. Only occupants who were linked to an emergency department or inpatient medical record were considered "injured." Therefore, any persons who sought medical care for injuries at other facilities such as urgent care clinics or private health care providers would have been classified as not injured. To the extent that injured persons were treated at other facilities, our study likely underestimated the number of minor injuries.

In conclusion, we found that established risk factors for fatal teen driver crashes, including restraint nonuse, transporting teen passengers, and speeding also increase the risk of nonfatal injury in single vehicle crashes. When passengers were present, they were most likely to be teens, and the risk of at least one occupant sustaining a serious injury was twice as high in the presence of teen passengers as when the driver was alone. Our findings also highlight the importance of teen driver seat belt use. Teen passengers were > 5 times as likely to all be restrained in a crash if their teen driver was restrained, and a driver not being belted was by far the strongest predictor of a serious injury (ARR = 7.0). Surveillance systems such as CODES that link crash data with health outcome data provide needed information to more fully understand the circumstances and consequences of teen driver nonfatal crashes and evaluate the effectiveness of strategies to improve teen driver safety.

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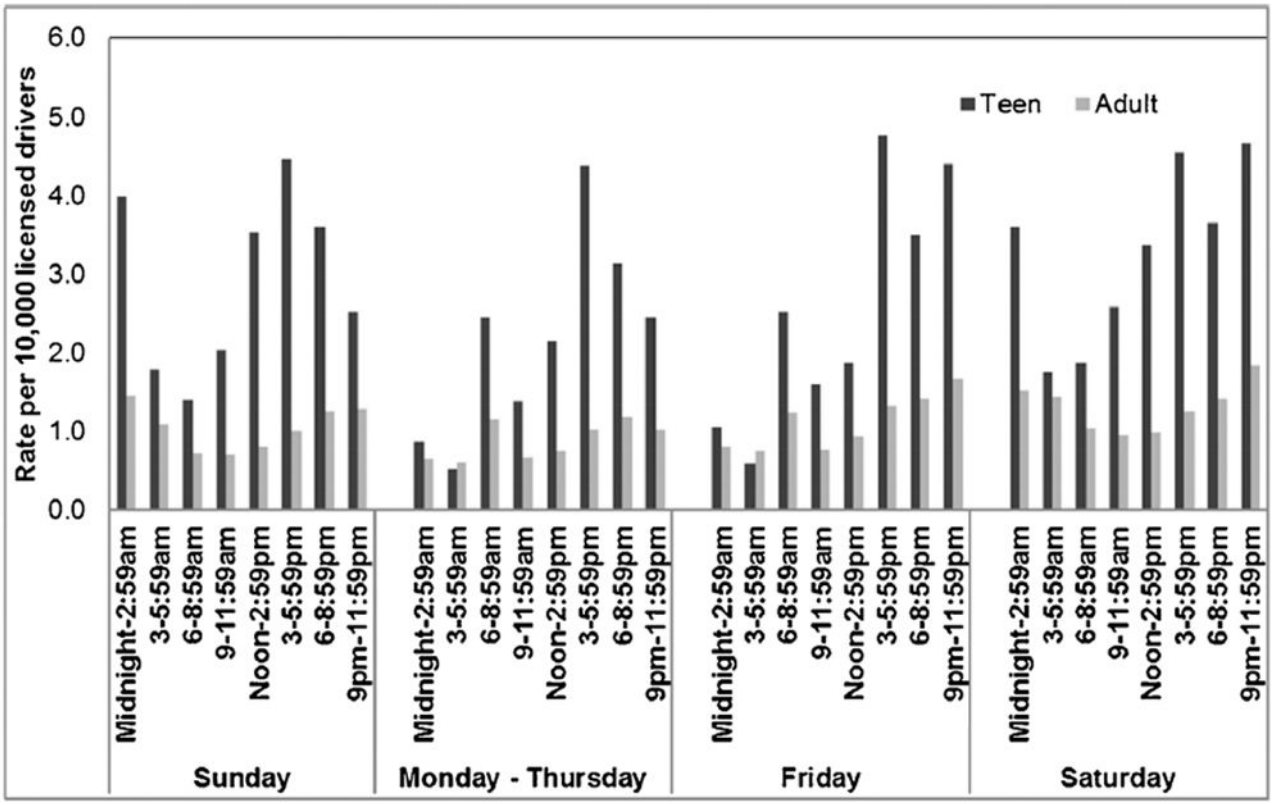

Fig. 1.

Teen (ages 15–17) and adult (ages 35–44) drivers in single vehicle nonfatal crashes by time of day, rates per 10,000 licensed drivers, South Carolina CODES, 2005–2008.

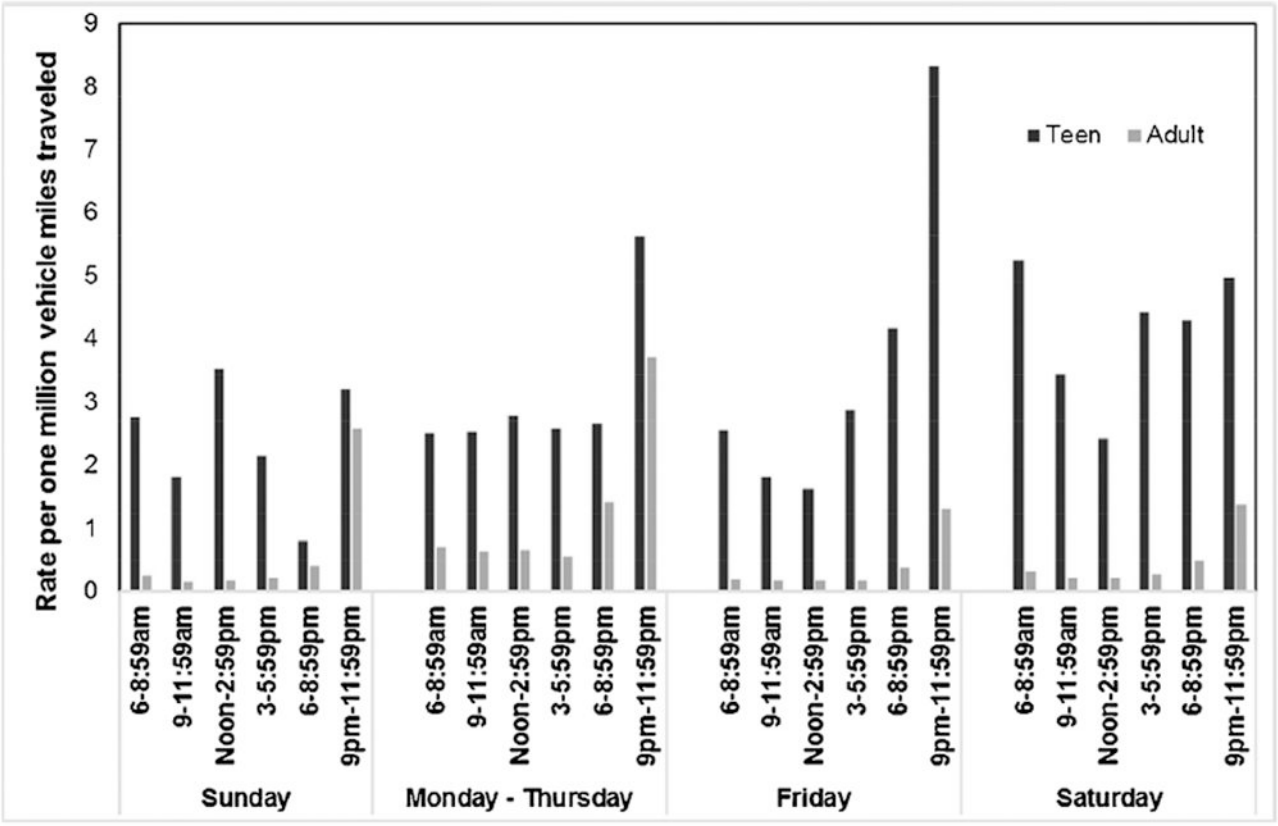

Fig. 2.

Teen (ages 15–17) and adult (ages 35–44) drivers in single vehicle nonfatal crashes by time of day, rates per one million vehicle miles traveled, South Carolina CODES, 2005–2008.

Note: Crashes per million vehicle miles traveled for the hours of midnight to 5:59 am were excluded due to sample sizes < 20 for some cells. Estimates of vehicle miles traveled (VMT) for South Carolina drivers were obtained from the 2009 National Household Travel Survey and multiplied by the total annual South Carolina VMT for the respective age group to estimate the number of VMT by time of day by day of week for each age group.

Table 1

Comparison of teen (ages 15–17) and adult (ages 35–44) passenger vehicle drivers in single vehicle nonfatal crashes per 10,000 licensed drivers by select characteristics, South Carolina CODES, 2005–2008.

	Characteristic	Teens (n = 6451)			Adults (n = 12,717)			p-value
		Count	%	Rate	Count	%	Rate	
	Total	6451	–	139	12,717	–	56	–
Gender	Male	3874	60	167	7379	58	66	<0.01
	Female	2577	40	112	5338	42	46	
Most severe injury sustained	No injury in crash	4625	72	100	9976	78	44	<0.01
	≥ 1 minor/moderate injury	1699	26	37	2501	20	11	
	≥ 1 serious injury	126	2	3	239	2	1	
Driver restraint use	Yes	5633	90	122	11,029	91	49	0.17
	No	611	10	13	1113	9	5	
Passengers	Driver only	3790	66	92	8689	79	44	<0.01
	Passengers, teen only	1425	22	31	248	2	1	
	Passengers include adult	352	5	8	1771	14	8	
	Other	405	6	9	600	5	3	
Driver restraint use by passenger status	Driver only, restraint use	4126	92	89	9603	90	42	<0.01
	Passengers, teen only, restraint use	1386	86	30	244	96	1	
	Passengers include adult, restraint use	338	90	7	1714	91	8	
	Other, restraint use	395	88	9	580	94	3	
First harmful event	Non-collision event	1015	16	22	1185	9	5	<0.01
	Collision, fixed object	4442	69	96	7312	58	32	
	Collision, not fixed	993	15	21	4220	33	19	
Clear weather	Yes	5275	82	114	10,332	81	45	0.35
	No	1176	18	25	2384	19	11	
Dark	Yes	1673	26	36	4382	34	19	<0.01
	No	4777	74	103	8335	66	37	
Speeding	Yes	3895	60	84	4165	33	18	<0.01
	No	2555	40	55	8552	67	38	
Weekend	Yes	2294	36	50	4310	34	19	0.03

	Characteristic	Teens (n = 6451)			Adults (n = 12,717)			p-value
		Count	**%**	**Rate**	**Count**	**%**	**Rate**	
	No	4156	64	90	8406	66	37	
Weekday afternoon	Yes	1035	16	117	1228	10	5	<0.01
	No	5415	84	22	11,489	9	51	

Note: Rate is expressed per 10,000 licensed drivers. P-values reflect comparisons of percentages of teen versus adult single vehicle crashes.

Table 2

Risk of minor/moderate injury (MAIS = 1,2) or serious injury (MAIS = 3+) compared with no injury in single vehicle nonfatal crashes with teen drivers ages 15–17 years, South Carolina CODES, 2005–2008.

Characteristic		Minor/Moderate injury N = 1,699				Serious injury N = 126			
		Crude risk ratio		Adjusted risk ratio		Crude risk ratio		Adjusted risk ratio	
		Risk Ratio	95% CI	Risk Ratio	95% CI	Risk Ratio	95% CI	Risk Ratio	95% CI
Gender	Male	**0.8**	0.7–0.8	**0.8**	0.7–0.8	1.3	0.9–1.9	1	0.8–3.1
	Female	1		1		1			
Driver restraint use	Yes	1				1			
	No	**2.0**	1.8–2.2	**1.8**	1.6–1.9	**8.3**	5.8–12.0	**7.0**	4.7–10.2
Passengers	None	1				1			
	Teen only passengers	**1.4**	1.3–1.6	**1.3**	1.2–1.4	**2.7**	1.8–3.9	**2.0**	1.3–2.9
	Passengers include an adult	1.2	1.0–1.4	1.1	1.0–1.4	1.2	0.5–2.9	1.2	0.5–3.0
	Other	**1.3**	1.1–1.5	1.2	1.0–1.4	1.7	0.8–3.3	1.5	0.8–3.1
First harmful event	Non-collision event	1				1			
	Collision, fixed object	**1.5**	1.3–1.7	**1.4**	1.2–1.6	**2.9**	1.4–5.9	1.7	0.8–3.6
	Collision, not fixed	**2.1**	1.8–2.5	**1.8**	1.5–2.1	**3.2**	1.4–7.1	1.6	0.7–3.9
Clear weather	Yes	**1.4**	1.2–1.6	**1.3**	1.2–1.5	**2.0**	1.1–3.4	1.6	0.9–2.9
	No	1				1			
Dark	Yes	**1.2**	1.1–1.3	1.1	1.0–1.2	**1.7**	1.2–2.5	1.5	1.0–2.2
	No					1			
Speeding	Yes	**1.3**	1.2–1.4	**1.2**	1.1–1.3	**1.7**	1.1–2.5	**1.7**	1.1–2.6
	No	1				1	1		
Weekend	Yes	1.1	1.0–1.2	–	–	1.0	0.7–1.5	–	–
	No					1			
Afternoon rush hour	Yes	0.9	0.8–1.0	–	–	0.6	0.4–1.1	–	–
	No	1				1			
Weekend night	Yes	1.0	0.8–1.3	–	–	1.0	0.4–2.9	–	–
	No	1				1			

Note: MAIS = Maximum Abbreviated Injury Scale, CI = confidence interval. Statistically significant risk ratios are bolded.