BEHAVIORAL ASPECTS OF YOUNGER AT-FAULT DRIVERS IN FATAL TRAFFIC CRASHES IN FLORIDA

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ABSTRACT

A study of fatal traffic crashes in Florida examined contributing factors among crashes in which younger (under age 25) drivers were found to be at fault. A case-based analysis was used to improve the accuracy and completeness of the data from the original crash reports. Results were presented using over-representation factors (ORF), a simplified but statistically significant approach to frequency distributions. Case studies found that non-human factors were primary contributing causes in only six percent of the crashes in which younger drivers were at fault, but secondary and tertiary contributing factors in up to 25 percent of those crashes. The most common non-human factor was tire blowouts/tread separation.

Younger drivers were at fault in 62 percent of the crashes in which they were involved, and they were highly overrepresented in fault in forward impacts with control loss and in left roadside departure crashes. These two crash types generally involved high speeds and abrupt steering input. Common human factors included alcohol use, inattention, and high speed. Approximately one in four younger at-fault drivers was under the influence of alcohol at the time of the fatal crash. No significant differences were noted between younger drivers (above or below the legal drinking age) and older drivers. Younger at-fault drivers were more likely to have had passengers in the vehicle at the time of the crash than older drivers. Most (91 percent) of the young at-fault drivers were in compliance with graduated driver licensing statutes at the time of the fatal crash.

INTRODUCTION

Nearly 50,000 drivers and passengers are killed in traffic crashes in the United States every year. According to the U.S. Census Bureau, Florida ranks 17th in the United States, with 1.71 traffic fatalities per 100 million vehicle miles traveled in 2003 (1). A pilot study by Spainhour *et al* (2) of fatal crashes involving both automobiles and heavy trucks on state highways indicated that there are significant differences among the driving behaviors of different age groups. The pilot study found that fault skews more heavily toward younger and older drivers, with 70 percent of the drivers aged 11-20 at fault, as were 67 percent of the drivers aged 81-90. These preliminary findings hinted that age might be a significant contributing factor to the fatal crashes, a factor that was investigated more thoroughly in a state-wide study that investigated both engineering and behavioral explanations for fatal crashes.

This paper deals with the contribution of age of the at-fault drivers on the occurrence of fatal crashes and looks specifically at crashes involving younger drivers. To explore the myriad factors that potentially affect younger drivers, this paper examines the contributing factors of fatal crashes in which the younger drivers were cited as being "at-fault." This analysis involved investigating individual fatal crashes on a case-by-case scenario, looking for driver, vehicle, environment, and roadway factors that may have contributed to the crash. Individual data elements were compiled with the help of photographic evidence to assess whether more general deficiencies such as inadequate sight distances, pavement markings, pedestrian safety measures, etc., existed at specific crash sites. Driver behavior and driver error was also noted, and vehicle speeds were reconstructed where possible. The goal of the research was to identify crash types in which younger drivers were more frequently "at fault," and then examine the contributing factors in those crashes. A better and more thorough understanding of factors relating and/or contributing to younger drivers' crashes could help engineers and decision/policy-makers to create more accessible and safer transportation systems.

LITERATURE REVIEW

The increasing rate of entrance of younger people as new drivers may require changes to the legal landscape and transportation system infrastructure to accommodate the younger population. The U.S. society faces challenges with the difficult and costly task of accommodating this cohort of population and their ability to be mobile. In the United States, driving laws and licensing practices are determined by each of the fifty states, the District of Columbia, and its territories. Unlike other nations, there is no national (federal) licensing law in the US although several states have implemented similar laws. In fact, a few states allow learner's permits at age fourteen; while majority of states allow permits at fifteen, and a few postpone *any* driving privileges until sixteen. Currently, and starting with Florida in 1996, numerous states have taken steps to combat young driver crashes by employing what is commonly referred to as a Graduated Driver's Licensing (GDL) system, in which younger student drivers are permitted incrementally greater autonomy and driving privileges. More details about the Florida GDL program are provided below.

Numerous researchers have examined crashes involving younger drivers. A few of these works that are most similar to the research described herein are summarized here. Ferguson, *et. al.* (3) conducted a decade long study to measure the progress of policies attempting to reduce the risk of teenage crash involvement. The authors incorporated data from FARS and GES systems and compared fatal crash statistics with population and mileage data from the Census Bureau and the 2001 National Household Travel Survey, respectively, to calculate crash rates from 1996 to 2005. The authors concluded that "substantial" progress has been made over the decade concerned in this study. Both fatal and non-fatal crash rates have gone down about 40%, 25%, and between 15% - 19%, for 16-, 17-, and 18-year-old drivers, respectively. They did caution, however, that although the purpose of this study was not to investigate the effectiveness of GDL laws, the results are consistent with the number of states adding such legislation to their driving standards.

A similar analysis by Williams, *et. al*., (4) obtained FARS data to compare the involvement of 15- and 16-year-old drivers in fatal crashes. They found that most of the fatal crashes involving 15-year-olds were either learner's permit holders or drivers in violation of the terms of those learner's permits. Furthermore, when compared to 16-year-olds, 15-year-olds were more often involved in single-vehicle crashes, during late evening hours, transporting other (many) passengers, and usually included risky driving factors like speeding and driving in the wrong lane. Williams, *et. al.* (5) reviewed a number of studies relating to the effects of passengers on teenage drivers and crashes. While their review was limited to North American studies involving 16 – 19 and 16 – 20 year old age groups, they also discussed separate Norwegian and Australian education and mass media campaigns targeting young passengers to reprimand peers driving in a risky manner and select travel partners wisely, respectively. Furthermore, they talk about the effectiveness of GDL systems enacted in the US and passenger restriction laws in New Zealand, California, and North Carolina. They concluded that although the majority of states have enacted GDL laws, opportunities exist for the expansion of passenger restriction laws and increasing the role of parents in educating young drivers.

Another study that utilized FARS information was carried out by Williams and Shabanova (6). In this investigation, an updated version of a 1978 study, the authors obtained data from the years 1996 to 2000, and analyzed it in terms of age, gender, and responsibility for one- and two-car fatal crashes. It was assumed that fatal single car crashes were the sole responsibility of the driver; however, in two-car fatal crashes, responsibility (as reported by the responding police officer) was assigned to the party “at fault” or “in error.” In summary, young males were more likely than young females to be responsible for crash deaths. When all crashes were considered, though, both youngest and oldest drivers were most likely to be responsible for fatalities. Lastly, they noted that younger drivers involved in fatal crashes were typically responsible for the death of others (especially their passengers), while older drivers were usually responsible for just their own deaths.

While the previously reviewed articles collected information from the FARS system, a number of studies gathered statistics from other sources such as hospital records, focus groups, questionnaires and surveys, and analysis of crash narratives. Results from these next studies still show some similarity to and consistency with the aforementioned articles. For example, risk taking behaviors, passenger influence(s), and personal assessment of driving ability are still prevalent as contributing factors in young driver car crashes. In each of these articles, a clear pattern emerges: young drivers involved in (fatal and non-fatal) car crashes consistently exhibit certain risky behaviors and inexperience, while the timing and type of crash variables are also similar.

Rhodes, *et. al*. (7) combined CARE data sets with a series of focus groups that included participants from the Birmingham metropolitan area and were reflective of the balance between gender and races in that geographic area. Therefore, the 38 respondents were divided into four groups: males (age 16 – 17), females (age 16 – 17); males (18 – 20), and females (18 – 20). In summary, they concluded (through the use of crash data sets and focus group responses) the following: risk taking such as racing and driving recklessly before and after school rush hours was prevalent, but not viewed as a high risk time to be driving; certain behaviors were seen as risky (e.g.-driving after drinking and non-seat belt use), while other behaviors were not perceived as risky (e.g.-transporting multiple friends and eating while driving); lastly, young drivers denied that their peers influence them to drive unsafely. This article is the presentation of the first year of a 5-year study.

McKnight and McKnight (8) analyzed the narrative descriptions of over 2,000 traffic accidents by drivers aged 16 – 19 in two states. These narratives originated from non-fatal car crashes in California and Maryland, and were investigated for behavioral contributors and components. They found that the vast majority of these accidents stemmed from the following attributes: errors in attention, visual searches, hazard recognition, speeding relative to conditions, and emergency maneuvers. High speeds and blatantly risky behavior accounted for only a small minority.

METHODOLOGY AND DATA SET

The research presented henceforth is part of a larger study investigating the contributing factors of fatal traffic accidents involving drivers of all ages (9). A major objective of this portion of the research was to provide an in-depth analysis of the relationships between the ages of the “at-fault” drivers and different aspects of roadway-, traffic-, weather- (and other) related contributing factors; however, this portion of the research focuses only on the subset of the fatal crashes involving younger drivers. For the purposes of this analysis, younger drivers are defined as those under age 25. The scope is limited to fatal traffic accidents because of the importance of ameliorating such serious crashes and because of the abundance of available data on these types of crashes.

One goal of the research, therefore, was to expand beyond the available data from the Florida Traffic Crash Report (FTCR) by incorporating data from additional resources. Crash reports often lack detail, especially regarding subjective driver information (e.g.-attitudes and actions), and thus make it difficult to differentiate causative factors and assign fault. Key sources of information were the Traffic Homicide Investigating (THI) reports obtained from Florida Highway Patrol (FHP) and local law enforcement agencies. Photographs of crash scenes were gathered from the various law enforcement agencies and/or the FDOT’s video catalog system. Site visits were also conducted so as to gain insight into questionable crash sites.

The data set originally consisted of 2,080 fatal crashes that occurred on Florida state roadways, primarily during the year 2000. A total of 3,825 drivers were involved in this set of crashes, of which age and/or fault status was unknown for 240 drivers. Of the 3,585 drivers of known age and fault status, 1,764 were identified as being at fault, and 1,821 were considered not at fault. The median age of the at-fault drivers was 38 years; the mode of the ages was 19 years-old, indicating that the majority of at-fault drivers were quite young. The kurtosis is negative, indicating that the age-specific data has a flat distribution with short tails. There were a total of 632 younger drivers in the database, of which 419 were found to be at fault.

To identify the contributing factors in the fatal crashes, this study utilized a case-based approach whereby available data for individual crashes was scrutinized in greater detail by a diverse team of homicide investigators, researchers, and traffic and safety engineers. Contributing causes were identified based on the detailed investigation of photographic evidence, officer and witness statements, posted speed limits, actual vehicle speeds/positions/travel lanes, etc. Over-representation factors (ORF), a simplified but statistically significant approach to frequency distributions, were used to determine the results of the case studies. This method is based on the approach utilized by the Crash Analysis Reporting Environment (CARE) software (10). An ORF indicates whether a certain factor occurs more or less frequently in a subset of crashes than in its complement. The ORF was calculated for various crash sub-types as follows:

$$ORF = \frac{R\_set}{R\_comp} = \frac{\frac{A}{A+B}}{\frac{C}{C+D}}$$

where:
A = number of positive outcomes for the set
B = number of negative outcomes for the set
C = number of positive outcomes for the set’s complement
D = number of negative outcomes for the set’s complement
R_set = proportion of positive outcomes for the set
R_comp = proportion of positive outcomes for the set’s complement

For instance, given the 3585 drivers in the study set (of which 632 were younger and 2953 were not), 66% of the 632 younger drivers (*R_set* = 419/(419+213)=0.66) were found to be at fault, while only forty-six percent of the 2953 non-younger drivers (*R_comp* = 1367/(1367+1586)=0.46) were found to be at fault. This implies that fault was overrepresented in younger drivers with an ORF of 1.44 (*ORF* = 0.66/0.46) compared to non-older drivers.

An ORF of 1.0 indicates that the characteristic occurs in the crash sub-set at the same rate that it does in the complement of the set; an ORF higher than 1.0 indicates that the characteristic occurs more frequently in the sub-set (i.e. is over-represented); an ORF less than 1.0 indicates that the characteristic occurs less frequently in the set than in its complement. The default over-representation threshold utilized by the CARE researchers for high levels of over- or under-representation is 1.5 and 0.667, respectively. These numbers mean that a characteristic can be said to be highly over- or under-represented in a data set if the characteristic occurs 50% more or less frequently in the observed set than in the complement. The basis of the over-representation method is that it is unlikely that a counter-measure will reduce the crash rate of a set (e.g.-alcohol-related accidents) below that of its complement (non-alcohol-related accidents). Therefore, by focusing attention on highly over-represented characteristics within a set, there is an increased chance of having a productive result.

The over-representation method is quite useful when differentiating trends between two different crash sub-sets; however, the reliability of this factor depends on the sample sizes of the two sub-sets in consideration. The smaller the sample size the less significant the result. To improve its usefulness when analyzing smaller data sets such as those involved in examining only fatal crashes, the researchers in this project have extended the concept of over-representation to include confidence intervals (CI’s). The over-representation factor is similar to a *relative risk* or the ratio of percentage of positive cases from the total population to the non-positive cases from the total population. Thus, the CI for an over-represented factor was calculated using techniques similar to those used for relative risk factors.

$$Var = \frac{\left(\frac{B}{A}\right)}{(A+B)} + \frac{\left(\frac{D}{C}\right)}{(C+D)}$$

$$LL = ORF * e\wedge -z * \sqrt{Var}$$

$$UL = ORF * e\wedge z * \sqrt{Var}$$

where:
LL = Lower limit of CI
UL = Upper limit of CI

z = z-statistic given the selected CI, e.g.- 1.96 for 95% confidence
Var = Var (in ORF) = Variance of the natural log of the over-represented factor

RESULTS AND DISCUSSION
There were 632 young (under age 25) drivers involved the fatal crashes, of which 419 were found to be at fault. Table 1 shows the distribution of fault among drivers of various ages. Drivers between 15 and 24 years old are highly overrepresented in fault when compared to other drivers, a result that is statistically significant at the 95 percent confidence level. The only other age groups that are highly overrepresented in fault are those over age 75.

Table 1: Driver Age Versus Driver Fault

Age Group	At-Fault		Not-At-Fault		At-Fault ORF	Min CI	Max CI	Level
	Number	Percent	Number	Percent				
0-14	1	0.1%	1	0.1%	1.036	0.065	16.556	Unsure
15-24	**419**	**22.7%**	**257**	**13.4%**	**1.690**	**1.467**	**1.946**	**Over**
25-34	354	19.2%	404	21.1%	0.908	0.799	1.032	Unsure
35-44	345	18.7%	442	23.1%	0.809	0.714	0.917	Under
45-54	232	12.6%	374	19.6%	0.643	0.553	0.747	Under
55-64	138	7.5%	204	10.7%	0.701	0.570	0.862	Under
65-74	118	6.4%	113	5.9%	1.082	0.843	1.389	Unsure
75-84	**130**	**7.0%**	**50**	**2.6%**	**2.694**	**1.957**	**3.710**	**Over**
85-94	**51**	**2.8%**	**8**	**0.4%**	**6.606**	**3.144**	**13.882**	**Over**
95-104	2	0.1%	0	0.0%	N/A	N/A	N/A	N/A
Unknown	56	3.0%	60	3.1%	0.967	0.676	1.384	Unsure
	1846	100.0%	1913	100.0%	1.000			

Crash Types
Table 2 shows the crash types of the crashes in which those drivers were involved. The categorization scheme was developed following an initial review of all the cases in the study, and a literature review of related studies wherein crash data is being summarized by crash type codes (11, 12, 13, 14, 15). It is primarily based on crash types used in the General Estimates System (GES) crash database (11), with enhancements for classifying pedestrian crashes. The first two categories are intersection crashes involving turning and intersecting paths, respectively, while the remaining four categories are non-intersection crashes. Within each crash type, the crashes are broken into mutually exclusive categories according to the vehicle actions and positions, generally. The confidence level is stated as "over" when the lower limit of the 95% confidence interval is above 1.0 and "under" when the upper limit is below 1.0. Crash types in which older drivers were significantly overrepresented are indicated by bold-face type; those in which older drivers were significantly underrepresented are indicated by italics.

Younger drivers were highly overrepresented in fault in forward impacts with control loss, that is, collisions with oncoming vehicles in which the driver lost control prior to the impact. This implies that when compared to at-fault drivers of other ages, younger drivers are more likely to be involved in forward impacts with control loss. Younger at-fault drivers were also highly overrepresented in left roadside departure crashes. These two crash types generally involve high speeds and abrupt steering input and potentially indicate inattention and/or an inability to use sound judgment and make quick decisions. Other crash types that were common although not overrepresented among young at-fault drivers were left roadside departures with control loss, rear end collisions, head-on collisions without control loss, and turning in front of oncoming traffic. Younger at-fault drivers were significantly underrepresented in crashes involving turning in front of cross traffic and turning in front of oncoming traffic, when compared to other at-fault drivers.

TABLE 2 Crash Types of Crashes Caused by Younger Drivers

Type	Sub-Type	Younger At-Fault		Other At-Fault		ORF	Min CI	Max CI	Level
		No.	Per.	No.	Per.				
Change Trafficway/ Turning	Initial Same Direction	0	0.0%	20	1.5%	0.000	N/A	N/A	N/A
	Single Vehicle Control Loss While Turning	0	0.0%	2	0.1%	0.000	N/A	N/A	N/A
	Turn Into Opposite Directions/Cross Traffic	**19**	**4.5%**	**121**	**9.0%**	**0.506**	**0.316**	**0.810**	**Under**
	Turn/Merge Into Same Direction	5	1.2%	18	1.3%	0.895	0.334	2.396	Unsure
	Evasive Action To Avoid Turning/Merging Vehicle	1	0.2%	2	0.1%	1.611	0.146	17.722	Unsure
	Initial Opposite Directions/Oncoming Traffic	**35**	**8.4%**	**160**	**11.9%**	**0.705**	**0.497**	**0.999**	**Under**
Intersecting Paths	Backing	1	0.2%	4	0.3%	0.805	0.090	7.187	Unsure
	Not At Fault From Left	20	4.8%	65	4.8%	0.991	0.608	1.617	Unsure
	Not At Fault From Right	28	6.7%	63	4.7%	1.432	0.930	2.205	Unsure
	Not At Fault Unknown Direction	0	0.0%	4	0.3%	0.000	N/A	N/A	N/A
Opposite Direction	**Forward Impact With Control Loss**	**16**	**3.8%**	**22**	**1.6%**	**2.343**	**1.242**	**4.420**	**Over**
	Sideswipe Angle	0	0.0%	3	0.2%	0.000	N/A	N/A	N/A
	Head-On	36	8.6%	101	7.5%	1.148	0.798	1.653	Unsure
Pedestrian	Exit Vehicle	0	0.0%	10	0.7%	0.000	N/A	N/A	N/A
	Unique	0	0.0%	1	0.1%	0.000	N/A	N/A	N/A
	Walking Along Road Against Traffic	1	0.2%	0	0.0%	N/A	N/A	N/A	N/A
	Crossing At Intersection In Crosswalk	2	0.5%	4	0.3%	1.611	0.296	8.764	Unsure
	Crossing Not At Intersection--First Half	4	1.0%	9	0.7%	1.432	0.443	4.626	Unsure
	Crossing Not At Intersection--Second Half	4	1.0%	14	1.0%	0.921	0.305	2.782	Unsure
	Other In Road	0	0.0%	6	0.4%	0.000	N/A	N/A	N/A
	Vehicle Turn/Merge	1	0.2%	7	0.5%	0.460	0.057	3.730	Unsure
	Walking Along Road With Traffic	1	0.2%	3	0.2%	1.074	0.112	10.297	Unsure
Run Off Road/ Single Vehicle	Ramp Departure	9	2.1%	22	1.6%	1.318	0.612	2.840	Unsure
	Forward Impact	2	0.5%	9	0.7%	0.716	0.155	3.301	Unsure
	Left Roadside Departure	**53**	**12.6%**	**85**	**6.3%**	**2.009**	**1.451**	**2.781**	**Over**
	Left Roadside Departure With Control Loss	46	11.0%	109	8.1%	1.360	0.981	1.885	Unsure
	Other	1	0.2%	1	0.1%	N/A	0.202	51.399	Unsure
	Right Roadside Departure	50	11.9%	171	12.7%	0.942	0.701	1.266	Unsure
	Right Roadside Departure With Control Loss	28	6.7%	73	5.4%	1.236	0.811	1.884	Unsure
Same Direction	Sideswipe Angle With Control Loss	3	0.7%	12	0.9%	0.805	0.228	2.841	Unsure
	Rear End	38	9.1%	159	11.8%	0.770	0.550	1.078	Unsure
	Rear End With Avoid Impact	7	1.7%	29	2.1%	0.778	0.343	1.762	Unsure
	Sideswipe Angle	6	1.4%	31	2.3%	0.624	0.262	1.484	Unsure
Other/Unknown		2	0.5%	10	0.7%	0.644	0.142	2.929	
Total		419	100%	1350	100%	1.000			

Crash Contributing Factors

Table 3 looks at contributing factors in fatal crashes where a younger driver was found to be at fault. The purpose of the case-study approach was to identify causative factors, which are those factors that contributed to the crash, as opposed to conditions that merely existed at the time of the crash. In fact, one of the key functions of the case studies, particularly the review of crash scene photographs, available videologs, and where deemed necessary, site visits, was to identify or rule out potential roadway contributing factors to the degree possible. In Table 3, primary, secondary, and tertiary contributing factors are identified. Where the factors are human-related, the primary and secondary factors could both belong to the same person (e.g. alcohol use and speeding by driver one), or the factors might belong to two different persons in the crash (e.g. speeding by driver one and inattention by driver two). The primary factor almost always belongs to the at-fault driver.

Examining the table, it is evident that human factors are the most common primary contributing factors in fatal crashes caused by younger drivers, accounting for almost 94 percent of the primary factors. Among human factors, alcohol, inattention, and speed are the most common factors. Speed is the most common human factor cited as a secondary causative factor. Abrupt steering input, decision errors, and inexperience are three of the human factors that are more common as secondary rather than primary factors caused by younger drivers. Roadway, environmental, and vehicle factors do not appear frequently as causative factors in the fatal crashes, but they appear more frequently as additional rather than primary factors. Overall, around 25 percent of the fatal crashes have roadway, environmental, and vehicle factors to some degree. The most common non-human factor was tire blowouts/tread separation, which was the primary contributor to about three percent of the crashes involving younger drivers. Wet or slippery conditions, darkness, and curvature were the most common secondary/tertiary non-human factors, indicating that the younger drivers, who tended to drive at higher speeds and have less experience behind the wheel, had more difficulty negotiating curves and driving in inclement weather.

TABLE 3 Contributing Factors in Crashes Where a Younger Driver was at Fault

Factor Class	Factor	Primary		Secondary	Tertiary	Total	
		Num.	Per.	Num.	Num.	Num.	Per.
Environment	Wet/Slippery	4	1.0%	12	22	38	4.1%
	Dark	0	0.0%	14	12	26	2.8%
	Smoke/Fog	0	0.0%	5	2	7	0.8%
	Dawn/Dusk	0	0.0%	0	1	1	0.1%
	Heavy Rain	0	0.0%	1	0	1	0.1%
	All Environmental	**4**	**1.0%**	**32**	**37**	**73**	**7.9%**
Human	Alcohol	90	21.5%	8	4	102	11.1%
	Inattention	82	19.6%	29	9	120	13.0%
	Speed	70	16.7%	60	9	139	15.1%
	Unknown	25	6.0%	0	0	25	2.7%
	Steering Input	21	5.0%	45	22	88	9.5%
	Decision	20	4.8%	28	3	51	5.5%
	Drugs	20	4.8%	3	2	25	2.7%
	Aggression	19	4.5%	9	1	29	3.1%
	Fatigue	16	3.8%	6	1	23	2.5%
	Alcohol & Drugs	12	2.9%	1	1	14	1.5%
	Medical	5	1.2%	1	0	6	0.7%
	Perception	4	1.0%	3	0	7	0.8%
	Distraction	3	0.7%	1	2	6	0.7%
	Inexperience	2	0.5%	19	4	25	2.7%
	Police Pursuit	2	0.5%	2	0	4	0.4%

	Mental/Emotional	1	0.2%	3	1	5	0.5%
	Confusion	1	0.2%	1	2	4	0.4%
	History	0	0.0%	2	6	8	0.9%
	Age	0	0.0%	2	1	3	0.3%
	Unfamiliar w/Vehicle	0	0.0%	2	0	2	0.2%
	Low Speed	0	0.0%	1	0	1	0.1%
	Other	0	0.0%	0	1	1	0.1%
	Physical Defect	0	0.0%	0	1	1	0.1%
	Unfamiliar w/Area	0	0.0%	0	1	1	0.1%
	All Human	**393**	**93.9%**	**226**	**71**	**690**	**74.7%**
Roadway	Access Point	3	0.7%	3	4	10	1.1%
	Obstruction	1	0.2%	5	3	9	1.0%
	Standing Water	1	0.2%	0	0	1	0.1%
	Curvature	0	0.0%	4	19	23	2.5%
	Lighting	0	0.0%	1	14	15	1.6%
	Construction	0	0.0%	8	2	10	1.1%
	Sight Distance	0	0.0%	6	4	10	1.1%
	Bike Facilities	0	0.0%	4	1	5	0.5%
	Congestion	0	0.0%	4	1	5	0.5%
	Traffic Operation	0	0.0%	2	3	5	0.5%
	Design/Geometry	0	0.0%	2	2	4	0.4%
	Sign/Signal	0	0.0%	2	2	4	0.4%
	Speed Limit	0	0.0%	0	3	3	0.3%
	Shoulder Design	0	0.0%	0	2	2	0.2%
	All Roadway	**5**	**1.10%**	**41**	**60**	**106**	**11.30%**
Vehicle	Tires	13	3.1%	3	5	21	2.3%
	Defect	2	0.5%	3	2	7	0.8%
	Other	1	0.2%	0	0	1	0.1%
	Visibility	0	0.0%	7	5	12	1.3%
	Emergency	0	0.0%	2	1	3	0.3%
	Lighting	0	0.0%	1	2	3	0.3%
	Overweight	0	0.0%	1	1	2	0.2%
	Jackknife	0	0.0%	0	1	1	0.1%
	Low Speed	0	0.0%	0	1	1	0.1%
	Trailer	0	0.0%	1	0	1	0.1%
	View Obstruction	0	0.0%	0	1	1	0.1%
	All Vehicle	**16**	**3.80%**	**18**	**19**	**53**	**5.70%**
Other/Unknown		1	0.2%	0	0	1	0.1%
Total		419	100.0%	317	187	923	100.0%

Critical Driver Errors

Because of the prevalence of human contributing factors, Table 4 looks more specifically at the types of drivers' errors of the young at-fault drivers. The driver errors are sorted from most to least frequent. Because the characteristics of intersection crashes tend to be different than other crashes, the two crash types are also listed separately in Table 4. From the data, it is evident that about thirty percent of the fatal crashes caused by the young drivers are due to exceeding safe speeds, while around one-quarter are due to abrupt steering input, resulting in loss of control of the vehicle. Loss of control crashes are those in which the drivers were driving within the speed limit, but applied excessive steering input and lost control of the vehicle, typically followed by events such as running off the roadway, entered into the median, etc. Despite being applicable primarily to intersection crashes, disregarding traffic signals is the third most common driver error, followed by failure to observe other vehicles/all sides, failure to slow/stop to avoid hitting the front vehicle, and disregarding stop signs.

Thirty-six percent of the fatal crashes caused by younger drivers occurred at intersections. As might be expected, disregarding traffic signals is the most common driver error in intersection crashes. Exceeding a safe speed is also a major cause of intersection crashes by the young drivers, followed by disregarding stop signs and failing to observe other vehicles/all sides. Combined, disregarded of traffic signals and stop signs by the young drivers causes more than 35% of the intersection crashes. Nearly two out of every five non-intersection fatal crashes caused by the young drivers are due to abrupt steering input/loss of control of the vehicle. It is notable that the second major contributing cause by the young drivers is the exceeding safe speed limits. Together, these two factors cause more than 70% of the non-intersection fatal crashes caused by the young drivers. These causes are understandable as young drivers have been shown to exceed safe speeds and drive carelessly, causing them to lose control of their vehicles. While the third major type of driver error is failure to slow or stop to avoid hitting a vehicle in front, it is attributed to only six percent of the non-intersection crashes.

TABLE 4 Drivers' Errors of Young At-Fault Drivers

	All Crashes		Intersection Crashes		Non-intersection Crashes	
Drivers' Errors/Critical Reasons	**Freq.**	**Perc.**	**Freq.**	**Perc.**	**Freq.**	**Perc.**
Exceeded Safe Speed	121	29.0	28	18.8	93	34.7
Abrupt Steering Input/Loss of Control	106	25.4	8	5.4	98	36.6
Disregarded Traffic Signal	32	7.7	31	20.8	1	0.4
Failed to Observe Vehicles/All Sides	27	6.5	19	12.8	8	3.0
Failed to Slow/Stop	26	6.2	10	6.7	16	6.0
Disregarded Stop Sign	20	4.8	20	13.4	0	0.0
Driving Wrong Direction	12	2.9	6	4.0	6	2.2
Improper Lane Change	12	2.9	0	0.0	12	4.5
Failed to Negotiate Curve	11	2.6	1	0.7	10	3.7
Fell Asleep	6	1.4	0	0.0	6	2.2
Misjudged Speed	6	1.4	6	4.0	0	0.0
Followed too Closely	3	0.7	1	0.7	2	0.7
Drove left of center	3	0.7	0	0.0	3	1.1
Improper U-Turn	2	0.5	1	0.7	1	0.4
Stopped in Road	2	0.5	0	0.0	2	0.7
Unknown/Unable to identify	28	6.7	19	12.1	11	3.7
Total	419	100	150	100.0	269	100.0

The data reported by the investigating officers show that "careless driving" is the most common contributing cause attributed to younger drivers, cited in 37 percent of the fatal crashes caused by younger drivers. However, case review teams found that the reporting officers had a tendency to select "careless driving" over other types of causes available to them, even when the other causes might be equally or more appropriate. As part of case-based analysis, the term "careless driving" was further categorized by identifying the exact driver error that was the critical reason for the fatal crash. As shown in Table 5, when carelessness is narrowed down, factors such as abrupt steering input, exceeding safe speeds, and failure to stop the vehicle to avoid rear-end collision come up as the major contributing causes. Recording these as "careless driving" by the investigation officers creates a category that is too broad to understand the actual situation and cause of the crash.

TABLE 5 Breakdown of Overused Term "Careless Driving"

Driver Error/Critical Reason	Number	Percentage
Abrupt Steering Input/Loss of control	55	36.9
Exceeding safe speeds	54	36.2
Failure to slow/stop vehicle	14	9.4
Improper lane change	6	4.0
Failure to negotiate curvature	5	3.4
Fell asleep	4	2.7
Disregarding traffic signal	3	2.0
Others	8	5.3
Total	149	100

Compliance with Graduated Licensing Statutes

Florida was one of the first states in the nation to introduce a graduated driver licensing (GDL) law for younger drivers. Implemented in 1996, one of the main provisions of the program restricts 16 year old drivers to the hours of 6 AM to 11 PM and 17 year old drivers to the hours of 5 AM to 1 AM. These restrictions are exempted if the driver has a passenger aged 21 or above in the vehicle or is traveling to or from work. A total of 45 fatal crashes were caused by 16 year old drivers. Of those drivers, only seven (16 percent) were not in compliance with the provisions of the GDL statutes. Another two at-fault 16 year olds were driving during late night hours, but were in compliance with the statutes because of the presence of an older passenger. Only two 17 year old at-fault drivers (3.5 percent) were not in compliance with the GDL laws; an additional two were in compliance because an older passenger was in the vehicle. Overall, fewer than nine percent of the at-fault 16 and 17 year old drivers were in violation of the GDL statutes at the time of the fatal crash. Only four drivers younger than age 16 were at fault in fatal traffic crashes, and all were driving non-standard vehicles (go-carts and bicycles).

Alcohol Use

As seen in Table 3, 116 of the 419 younger drivers involved in the fatal crashes were under the influence of alcohol (with or without illegal drugs) at the time of the crash. Alcohol was identified the primary contributing factor in 90 of those crashes, and a combination of alcohol and drugs in 12 more. In addition, six of the 213 not-at-fault younger drivers were also found to be under the influence of alcohol, but not the primary cause of the crash. As such, it was deemed important to explore alcohol use among younger drivers more thoroughly. Table 5 presents blood alcohol concentration (BAC) data, as extracted from the traffic homicide report when available. This data was found to be more accurate than that provided on the original crash reports, because the information on the original crash report was frequently missing or based upon initial (incorrect) assumptions. However, the unknown cases include those where a BAC test was conducted but no results were provided on the original crash report and no follow-up homicide report was available.

Table 6 indicates that approximately 20 percent of young at-fault drivers were under the influence of alcohol at the time of the crash, including those with BAC's under the legal limit. Eighteen percent of the at-fault drivers below the legal drinking age in the state of Florida were under the influence at the time of the crash, while 31 percent of those between ages 21 and 24 were under the influence. For all younger at-fault drivers, an average of 24 percent were under the influence, which is slightly less than the rate for other (25 and older) drivers, 26 percent. This fact is echoed in Table 6, which shows that the 95 percent confidence intervals for almost every row to include the value one. This means that there are no significant differences in the alcohol use between younger and other at-fault drivers.

TABLE 6 Alcohol Use Among Younger At-Fault Drivers

Alcohol Use	Young		Young		Other		ORF	Min CI	Max CI	Level
	Under Legal Age (16-20)	Over Legal Age (21-24)	No.	Per.	No.	Per.				
BAC = 0[1]	143	95	237	56.6	786	57.3	0.987	0.897	1.086	Unsure
BAC < Legal limit	11	7	18	4.3	49	3.6	1.203	0.709	2.042	Unsure
BAC 1-2 X Legal limit	13	20	33	7.9	89	6.5	1.214	0.827	1.783	Unsure
BAC 2-3 X Legal limit	14	23	37	8.8	139	10.1	0.872	0.617	1.232	Unsure
BAC > 3 Legal limit	**2**	**6**	**8**	**1.9**	**77**	**5.6**	**0.340**	**0.166**	**0.699**	**Under**
BAC Unknown (> 0)	2	2	4	1.0	6	0.4	2.183	0.619	7.699	Unsure
Unknown	48	34	82	19.6	226	16.5	1.188	0.946	1.492	Unsure
TOTAL	233	187	419	100.0	1372	100.0	1.000			

[1] Includes BAC presumed zero (no BAC test conducted)

Presence of Passengers

Because the presence of passengers has been shown to be a potentially distracting factor, Table 7 compares the number of passengers in the vehicles of at-fault drivers by age groups. Overall 48 percent of younger at-fault drivers had passengers at the time of the fatal crash, while almost 43 percent of the other drivers had passengers. Examining the data by passenger count, younger at-fault drivers were over eight times more likely to have a single passenger in the vehicle with them, a significant result. However, younger drivers were somewhat less likely to have larger numbers of passengers in the vehicle, with varying levels of significance. This likely reflects the driving habits of the different age groups, where older drivers are more likely to have higher numbers of passengers. When all passengers are combined into a single group, younger drivers are about ten percent more likely (ORF=1.136) to have some (greater than zero) passengers than other drivers, a significant result.

TABLE 7 Passenger Presence in Vehicles of Younger At-Fault Drivers

Number of Passengers	Younger		Other		ORF	Min CI	Max CI	Level
	Number	Percent	Number	Percent				
0	203	51.8	786	57.5	0.900	0.804	1.008	Unsure
1	**115**	**29.3**	**49**	**3.6**	**8.178**	**7.017**	**9.532**	**Over**
2	31	7.9	89	6.5	1.214	0.867	1.699	Unsure
3	**23**	**5.9**	**139**	**10.2**	**0.577**	**0.388**	**0.856**	**Under**
4	16	4.1	77	5.6	0.724	0.449	1.167	Unsure
5+	**4**	**1.0**	**226**	**16.5**	**0.062**	**0.023**	**0.163**	**Under**
>0	**189**	**48.2**	**580**	**42.5**	**1.136**	**1.016**	**1.270**	**Over**
TOTAL	392	100.0	1366	100.0	1.000			

CONCLUSIONS AND RECOMMENDATIONS

A study of fatal traffic crashes in Florida examined contributing factors among crashes in which younger drivers were found to be at fault. Younger drivers (under age 25) were at fault in 62 percent of the crashes in which they were involved, and they were highly overrepresented in fault in forward impacts with control loss and in left roadside departure crashes. These two crash types generally involved high speeds and abrupt steering input, as confirmed by the critical driver errors found in the study. Common human factors cited in the crashes included alcohol use, inattention, and high speed. These factors potentially indicate an inability to use sound judgment and make quick decisions.

An important aspect of this study is that a case-based analysis was used to improve the accuracy and completeness of the data in the original crash report. Case studies found that non-human factors were primary contributing causes in only six percent of the crashes in which younger drivers were at fault, but secondary and tertiary contributing factors in up to 25 percent of those crashes. The most common non-human factor was tire blowouts/tread separation; wet or slippery conditions, darkness, and curvature were the most common secondary/tertiary non-human factors, indicating that the younger drivers, had more difficulty negotiating curves and driving in inclement weather.

Approximately one in four younger at-fault drivers was under the influence of alcohol at the time of the fatal crash. No significant differences were noted between younger drivers and older drivers, nor were there significant differences between young drivers above and below the legal drinking age. Younger at-fault drivers were more likely to have had passengers in the vehicle at the time of the crash. Younger drivers were less likely to have multiple passengers, but younger at-fault drivers were over eight times as likely to have a single passenger than older drivers. Most (91 percent) of the young at-fault drivers were in compliance with graduated driver licensing statutes at the time of the fatal crash.

As stated previously, one of the main reasons for conducting detailed case reviews was to identify or exclude factors, especially non-human factors, that might have contributed to the crash. While every effort has been made to accurately assess the potential factors associated with each crash, it should be noted that there are limitations to this approach. For instance, a crash that appeared to be caused by disregarding a traffic signal (i.e. due to inattention) could actually have been caused by inexperience (e.g. stepping on the gas rather than the brake). Further research should be conducted to investigate root causes (e.g. distraction due to internal/external factors) and potential countermeasures to crashes in which younger drivers are more frequently found to be at fault. For example, simulator studies can safely investigate issues such as appropriate steering input in response to unexpected or emergency situations.

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