City of
FRESNO

POLICE DEPARTMENT

July 8, 1998

TO: MAYOR JIM PATTERSON
COUNCIL PRESIDENT MATHYS
COUNCILMEMBERS

THROUGH: JEFFREY M. REID
City Manager

FROM: ED WINCHESTER
Chief of Police

SUBJECT: FATAL TRAFFIC COLLISIONS - RED LIGHT VIOLATIONS

At the June 30th, 1998, Council Meeting, the issue arose as to whether or not Fresno was ranked number two in the nation or not in fatal traffic collisions per 100,000 residents caused by running red lights. The Insurance Institute for Highway Safety conducted a study of fatal traffic collisions caused by the running of red lights. The study covered the time period from 1992 through 1996. A copy of the study is attached. Fresno was ranked number seven of the cities studied with 19 such collisions during this five-year time period. The Insurance Institute released a press release on May 20th, 1998, with a synopsis of the study. The Associated Press did a wire story which, again, only contained a synopsis of the Insurance Institute's news release. The Fresno Bee did a story on May 21st, 1998. The Fresno Bee article contained only a summary of the Associated Press' summary of the Insurance Institute's summary. By the time the study results had been filtered in this manner, the news reports bore little resemblance to the actual study results.

A ranking of even number seven in this type of study is not desirable. However, the City of Fresno has made great strides in improving traffic safety since the time period covered by the study.

Prior to the advent of Problem Oriented Policing Teams, the Traffic Unit was used as a tactical team to police special events. The POP Teams now police special events, freeing up the Traffic Unit to concentrate on traffic enforcement.

In 1997, the City added five traffic officers bringing the total to fifteen. This was accomplished with an equipment grant from the State Office of Traffic Safety and implementation of release fees for vehicles impounded from unlicenced drivers to pay the salaries of the additional officers.

In 1997, the Police Department focused enforcement efforts on unlicenced drivers and DUI's. Studies have shown in the past that unlicenced drivers are involved in four times as many fatal accidents as licensed drivers, and are six times as likely to be involved in injury accidents.

The Insurance Institute, in its study of red light accidents, found that alcohol impaired drivers are far more likely to run red lights than unimpaired drivers, and were much more likely to have been driving with a suspended, revoked or otherwise invalid driver's license. The Insurance Institute concluded, "Because drivers with invalid drivers' licenses and high blood alcohol content frequently are involved in red light running crashes, targeting these behaviors through laws and enforcement is important."

The enforcement approaches implemented by the Police Department are producing positive results. In 1997, this city experienced 26 fatal accidents. This was the lowest number of fatal accidents in the past ten years, and a 53% reduction over 1996. The number of DUI fatal accidents was 70% lower in 1997 than in 1996 (4 compared to 14). According to the study by the Insurance Institute, Fresno had 19 fatalities caused by red light running during the five-year time period from 1992 through 1996. This would be an average of 3.8 fatalities per year. In 1997, Fresno had only one fatality caused by the running of a red light.

c: Bob Quesada, City Manager's Office
City Attorney's Office

Prevalence and Characteristics of Red Light Running Crashes in the United States

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ABSTRACT

Many urban motor vehicle crashes occur at intersections and often result from drivers disregarding traffic signals. In recent years, the number of crashes at traffic signals has increased considerably. Despite concerns about the frequent occurrence of red light violations and the significant crash consequences, relatively little is known about the overall prevalence and characteristics of red light running crashes. The present study examines the prevalence of red light running crashes on a national basis and identifies the characteristics of such crashes and the drivers involved. Cities with especially high rates of fatal red light running crashes are identified. Countermeasures to reduce red light running crashes based on collision patterns and characteristics of drivers involved are discussed.

It was estimated that about 260,000 red light running crashes occur annually, of which approximately 750 result in fatalities. Comparisons were made between red light running drivers and drivers deemed not to have run red lights in these same crashes. As a group, red light runners were more likely than other drivers to be younger than age 30, male, have prior moving violations and convictions for driving while intoxicated, have invalid driver's licenses, and have consumed alcohol prior to the crash. Comparisons also were made between characteristics of red light runners involved in daytime and nighttime crashes. Nighttime red light runners were more likely than daytime runners to be young, male, and have more deviant characteristics, 53 percent having high blood alcohol concentrations.

INTRODUCTION

About 40 percent of motor vehicle crashes in the United States occur at intersections or are deemed "intersection related" (U.S. Department of Transportation (U.S. DOT), 1997). In recent years, the number of crashes reported at intersections controlled by traffic signals has been increasing. Between 1992 and 1996, the number of fatal crashes at traffic signals increased 19 percent (from 1,888 to 2,242), while the number of all other fatal crashes increased 6 percent (U.S. DOT, 1993, 1997). During the same period, the number of injury crashes at intersections with traffic signals increased by approximately 14 percent (U.S. DOT, 1993, 1997).

One factor that contributes to multiple-vehicle crashes at intersections, as well as those involving pedestrians, is noncompliance with traffic control devices such as stop signs and traffic signals. In fact, such traffic violations are a major cause of urban motor vehicle crashes. In a study of police-reported crashes from four urban areas, Retting et al. (1995) found that "ran traffic control" was the single most common type of crash, accounting for 22 percent of all urban crashes and 27 percent of injury crashes. This same study found that injuries were more likely in collisions involving red light running than in other crash types; injuries were reported in 45 percent of red light running crashes compared with 30 percent for other crashes.

Limited research is available regarding the extent to which drivers in the United States commit red light violations and the characteristics of red light runners. Retting et al. (in press) used automated cameras at two busy urban intersections in Arlington, Virginia, over several months to observe the frequency of red light violations. Vehicles entering at any time after onset of the red signal were counted, except those turning right on red, emergency vehicles, and funeral processions. A total of 8,121 red light violations were recorded during 2,694 hours of data collection for an average of three violations per hour. Retting et al. (1998) reported a red light violation rate of approximately 13 violations per 10,000 vehicles at 12 intersections in a California city prior to introduction of an automated enforcement program. Retting and Williams (1996) compared the demographics and driving records of red light runners with a comparison group of motorists who had an opportunity to run a red light at the same intersection but did not. Red light runners as a group were younger, less likely to use seat belts, and had poorer driving records than drivers who stopped for red lights. Red light runners were more than three times as likely as compliers to have multiple prior speeding convictions. No gender differences were found between the two groups (about 70 percent of both red light runners and compliers were male).

Despite concerns about the frequent occurrence of red light violations and the significant crash consequences, relatively little is known about the overall prevalence and characteristics of red light

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running crashes. Nor does available research define the problem in terms of the circumstances under which it is most likely to occur and who is most likely to be involved. The present study was undertaken to examine the prevalence of red light running crashes on a national basis and to identify the characteristics of such crashes and the drivers involved.

METHOD

Two databases were employed in these analyses. The Fatality Analysis Reporting System (FARS) contains details of virtually all police-reported fatal motor vehicle crashes in the United States (National Highway Traffic Safety Administration (NHTSA), 1996a). The General Estimates System (GES) is based on a nationally representative probability sample selected from police crash reports in approximately 400 police agencies (NHTSA, 1996b). GES includes crashes of various degrees of injury as well as those involving only property damage.

Using FARS variables, a fatal red light running crash was defined as one that took place at an intersection controlled by a traffic signal and involved a driver going straight ahead who was assigned a driver level factor of "failure to obey traffic control device." Variables in GES are somewhat different from those in FARS. Accordingly, a GES red light running crash was defined as one that took place at an intersection controlled by a traffic signal and involved a driver who was either assigned the critical event code, "encroaching into another vehicle's lane at junction; entering intersection-straight across path," or who was going straight ahead and was charged with the violation "running a traffic signal or stop sign."

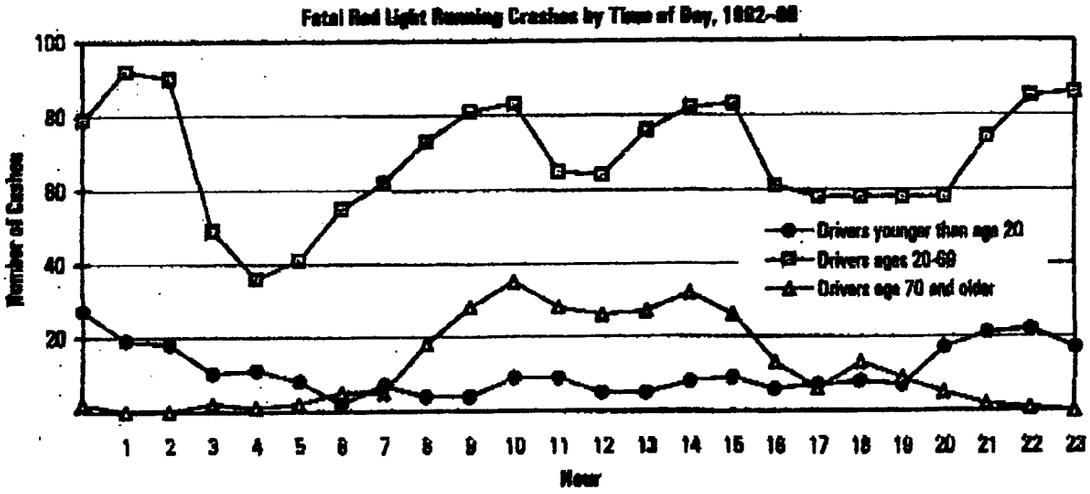
For the purpose of comparing characteristics of red light runners with drivers deemed not to have run red lights in the same crashes, a subset of the red light running crashes was developed. The subset was restricted to crashes involving just two drivers, both of whom were going straight prior to the crash and only one of whom met the definition of a red light runner. The purpose of eliminating from this analysis left-turn crashes and those involving more than two vehicles was intended to simplify the assignment of driver culpability. Pedestrian and bicyclist crashes also were excluded. Drivers deemed not to have run red lights in these crashes can be considered case controls in that they were on the same roads at the same times as red light runners.

For the purpose of aggregating crashes into (approximately) daytime and nighttime events, crashes that occurred between 6 a.m. and 5:59 p.m. were categorized as daytime crashes, and those that occurred between 6 p.m. and 5:59 a.m. were categorized as nighttime crashes.

RESULTS

Fatal crashes: During the five-year period 1992-96, a total of 3,753 fatal crashes met the red light running definition. This represents approximately 3 percent of all fatal crashes. Ninety-seven percent of the red light running crashes involved two or more vehicles; 3 percent involved pedestrians or bicyclists. The number of fatal red light running crashes increased 15 percent from 702 in 1992 to 809 in 1996.

Red light running crashes were twice as likely as other fatal crashes to occur on urban roads (86 versus 42 percent) and were more likely than other fatal crashes to occur during the day (57 percent versus 48 percent). Both red light running (91 percent) and other crashes (87 percent) occur primarily in good weather conditions. The number of fatal red light running crashes for the five-year period by time of day and driver age group is shown in the figure. For drivers age 70 and older, crash events occurred primarily during the day, whereas the peak time for the crashes of teenagers and those drivers ages 20-69 was around midnight.



Selected characteristics of drivers in fatal crashes are reported in Tables 1 and 2. Data are from the subset of 2,229 fatal red light running crashes that had two drivers, both of whom were going straight ahead, and only one of whom met the definition of a red light runner. This set of crashes represents 59 percent of all fatal red light running crashes that occurred in 1992-96.

Red light runners were more likely than non-runners to be younger than age 30 (43 percent versus 32 percent) and were somewhat more likely than non-runners to be male (74 percent versus 70 percent). Among red light runners, the percentage of male drivers differed by age group; 86 percent of red light runners younger than age 20 were male, compared with 60 percent of those age 70 and older.

Red light running drivers were somewhat more likely than non-runners to be fatally injured in these crashes; 40 percent of red light runners were killed versus 34 percent of non-runners. Deaths of drivers or passengers occurred in 55 percent of the vehicles of red light runners and in 47 percent of the vehicles of non-runners. Among red light runners, the chance of being killed in these crashes differed by age group; 72 percent of older drivers (age 70 and older) were killed, whereas 29 percent of drivers younger than age 20 were killed.

Table 1
Drivers in Fatal Red Light Running Crashes (Percent)

	Runners (N=2,229)	Non-Runners (N=2,229)
Male	74	70
Female	26	30
Age		
<20	12	7
20–29	32	24
30–39	20	23
40–49	10	18
50–59	7	12
60–69	7	6
70–79	6	5
≥80	5	2
Driver Injury Severity		
Killed	40	34
A Injury	18	15
B Injury	17	17
C Injury	10	14
Uninjured	14	20
Vehicle Type		
Automobile	64	59
Utility/Van	12	13
Pickup	16	12
Heavy Truck	5	11
Motorcycle	3	1
Other	1	3
Vehicle Role in Crash		
Striking	65	42
Struck	35	58
Police Reported Alcohol	34	4
BAC 0.10 Percent + (Fatally Injured Driver)	35	8
Driver's License Status = Susp/Revok/Expired/Not Licensed	23	8
Previous Driving History		
Crash(es)	23*	21
DWI	9	4
2 or More Moving Violations	18	14

Distributions of runners and non-runners differed significantly at $p<.01$ using chi-square test, except where noted by (*).

Police provided information about suspected alcohol involvement (any amount of alcohol, not necessarily in excess of legal thresholds) for about two-thirds of drivers involved in these crashes. Research comparing police reports of alcohol with chemical test results has indicated that when police officers make judgments about the presence or absence of alcohol for fatally injured passenger vehicle drivers, they usually are correct (Williams and Wells, 1991). Police were far more likely to report alcohol consumption for red light runners than for non-runners (34 percent versus 4 percent). The prevalence of alcohol was about the same for red light runners younger than age 20 as for those ages 20-69; alcohol rarely was indicated for older drivers.

Table 2
Red Light Runners in Fatal Crashes by Age Group (Percent)

	Age <20 (N=298)	Age 20-69 (N=1,550)	Age ≥70 (N=288)
Male	86	74	60
Female	14	26	40
Driver Injury Severity			
Killed	29	36	72
A Injury	20	19	11
B Injury	25	18	8
C Injury	9	11	4
Uninjured	17	16	5
Vehicle Type			
Automobile	68	58	80
Utility/Van	12	14	4
Pickup	15	18	5
Heavy Truck	1	7	1
Motorcycle	2	3	0
Other	1	2	1
Police Reported Alcohol	37	38	1
BAC 0.10 Percent + (Fatally Injured Driver)	25	30	0
Driver's License Status = Susp/Revok/Expired/Not Licensed	36	24	3
Previous Driving History			
Crash(es)	20	23	17
DWI	5	9	2
2 or More Moving Violations	15	20	3

Further analyses of alcohol involvement were conducted using chemical test results. Fatally injured red light running drivers were much more likely than other drivers in these crashes to have blood alcohol concentrations (BACs) of 0.10 percent or more (35 percent versus 6 percent). All fifty states and the District of Columbia have legal thresholds for alcohol-impaired driving offenses, such as driving while intoxicated (DWI), typically 0.10 percent.

Alcohol crashes differed significantly from non-alcohol crashes in regard to which driver in the crash — the red light runner or other driver — was fatally injured (Table 3). In non-alcohol crashes, red

light running drivers and their passengers were more likely than other drivers and their passengers to be killed (58 percent versus 40 percent). In alcohol crashes, fatal injuries were less common among red light running drivers and their passengers (41 percent versus 55 percent).

Table 3
Occupants Killed in Red Light Running Crashes

	Crashes Where Police Reported Alcohol		Crashes Where Police Reported No Alcohol	
Occupant Killed	#	Percent	#	Percent
Red Light Runner or Passenger	223	41	728	58
Other Driver or Passenger	297	55	504	40
Both	20	4	17	2

Red light runners were much more likely than non-runners to have been driving with suspended, revoked, or otherwise invalid driver's licenses. Younger drivers were particularly likely to be unlicensed. Red light runners and non-runners did not differ significantly in terms of prior crashes in their driving histories. Red light runners were significantly more likely than non-runners to have prior DWI convictions and two or more moving violation convictions of any type.

Red light running crashes that occur at night differ from those that occur during the day (Table 4). Males make up a greater percentage of red light runners in nighttime crashes than in daytime crashes (83 percent versus 67 percent). Red light runners in nighttime crashes generally were younger (median age 26) than those in daytime crashes (median age 40) and were more likely to have prior DWI convictions, multiple moving violations, and invalid driver's licenses. For some 435 crashes in which police reported on alcohol involvement, alcohol was indicated for red light runners in 58 percent of nighttime crashes and in 12 percent of daytime crashes; results of chemical tests were similar.

Table 4
Characteristics of Nighttime vs. Daytime Red Light Runners

	Night (N=1,845)	Day (N=1,172)
Median Age	26	40
Age <30	59%	29%
Age >69	4%	21%
Male	83%	67%
Police Reported Alcohol	58%	12%
BAC ≥0.10 Percent	53%	11%
2 or More Moving Violations	24%	14%
Prior DWI	12%	6%
Invalid License	30%	10%

Based on census estimates for 1995, there were 78 cities in the United States with populations of more than 200,000 residents (U.S. Census Bureau, 1997). These cities accounted for 34 percent of all fatal red light running crashes that occurred in 1992-96, excluding pedestrian and bicycle crashes. Population-based crash rates were computed and are provided for these cities (Table 5). The average rate was 2.5 crashes per 100,000 residents for the five-year period. There was considerable variation in this rate, which ranged from 0.21 to 8.11 per 100,000 population.

Table 5
Fatal Red Light Running Crashes per 100,000 Population

Rank	City	State	Population	No. of Crashes	Crashes per 100,000 Population	Rank	City	State	Population	No. of Crashes	Crashes per 100,000 Population
1	Phoenix	AZ	1,095,706	89	8.11	40	Baton Rouge	LA	229,027	5	2.18
2	Mesa	AZ	324,854	23	7.08	41	Tulsa	OK	377,152	8	2.12
3	Memphis	TN	623,902	34	5.45	42	Chicago	IL	2,749,881	58	2.11
4	Tucson	AZ	449,981	23	5.11	43	San Antonio	TX	998,900	21	2.10
5	St. Petersburg	FL	242,228	12	4.95	44	Lexington	KY	239,660	5	2.09
6	Dallas	TX	1,042,068	51	4.89	45	Tampa	FL	288,882	6	2.07
7	Fresno	CA	388,486	19	4.89	46	Richmond	VA	203,133	4	1.97
8	Birmingham	AL	270,726	13	4.80	47	Minneapolis	MN	367,709	7	1.96
9	Albuquerque	NM	418,714	20	4.77	48	Fort Worth	TX	480,321	9	1.96
10	Louisville	KY	272,838	12	4.40	49	Lincoln	NE	204,828	4	1.95
11	Corpus Christi	TX	280,505	12	4.28	50	Aurora	CO	256,857	5	1.95
12	Detroit	MI	997,297	41	4.11	51	Milwaukee	WI	622,467	12	1.93
13	Omaha	NE	348,089	14	4.02	52	Jacksonville	FL	678,148	13	1.91
14	Los Angeles	CA	3,466,211	136	3.92	53	San Diego	CA	1,157,771	22	1.90
15	Anaheim	CA	283,562	11	3.88	54	Seattle	WA	529,526	10	1.89
16	Sacramento	CA	375,845	14	3.72	55	Baltimore	MD	712,209	13	1.83
17	St. Louis	MO	371,425	13	3.50	56	Jersey City	NJ	227,195	4	1.76
18	Austin	TX	523,881	18	3.44	57	Norfolk	VA	243,857	4	1.64
19	Toledo	OH	323,972	11	3.40	58	Oakland	CA	377,800	6	1.59
20	Colorado Springs	CO	324,441	11	3.39	59	San Jose	CA	822,845	13	1.58
21	Denver	CO	505,843	17	3.36	60	Nashville	TN	523,881	7	1.34
22	Houston	TX	1,734,336	57	3.29	61	Wichita	KA	311,675	4	1.28
23	Philadelphia	PA	1,528,846	49	3.20	62	Buffalo	NY	312,366	4	1.28
24	Anchorage	AK	253,500	8	3.16	63	Raleigh	NC	240,891	3	1.25
25	Las Vegas	NV	317,900	10	3.15	64	Cleveland	OH	495,074	6	1.21
26	Stockton	CA	223,762	7	3.13	65	Miami	FL	378,720	4	1.06
27	Santa Ana	CA	292,288	9	3.08	66	New Orleans	LA	487,179	5	1.03
28	El Paso	TX	590,215	18	3.05	67	Charlotte	NC	395,934	4	1.01
29	Kansas City	MO	445,548	13	2.92	68	Virginia Beach	VA	435,958	4	0.92
30	Washington	DC	554,000	16	2.89	69	Akron	OH	222,884	2	0.90
31	Riverside	CA	242,858	7	2.88	70	Rochester	NY	230,749	2	0.87
32	San Francisco	CA	738,371	21	2.84	71	New York City	NY	7,318,546	62	0.85
33	Atlanta	GA	404,337	11	2.72	72	Boston	MA	550,715	4	0.73
34	Newark	NJ	280,232	7	2.69	73	Arlington	TX	292,324	2	0.68
35	Portland	OR	456,623	12	2.62	74	Cincinnati	OH	359,748	2	0.56
36	Long Beach	CA	438,034	11	2.52	75	Honolulu	HI	860,266	4	0.45
37	Indianapolis	IN	731,327	18	2.46	76	Columbus	OH	638,729	2	0.31
38	Mobile	AL	206,138	5	2.43	77	Pittsburgh	PA	364,308	1	0.29
39	St. Paul	MN	264,539	6	2.27	78	Oklahoma City	OK	468,232	1	0.21

Injury and property damage crashes: During 1996, a total of 257,849 crashes met the red light running definition. These crashes represent approximately 4 percent of the estimated 6,833,669 total police-reported crashes. For urban roads, there were 113,204 crashes that met the red light running definition, representing approximately 5 percent of the estimated 2,198,143 total police-reported crashes. Red light running crashes accounted for 5 percent of all injury crashes nationwide and 7 percent of injury crashes on urban roads. Red light running crashes were more likely than other crashes to have produced some degree of injury (47 percent versus 33 percent). The distribution of red light running injury crashes by approximate severity level is as follows: 15 percent resulted in fatal or incapacitating (A-type) injuries, 31 percent resulted in non-incapacitating (B-type) injuries, and 54 percent produced possible (C-type) injuries. The severity distribution was similar for other types of injury crashes. Red light running crashes were more likely than other crashes to occur on urban roads (44 percent versus 32 percent) and were somewhat more likely to occur during the day (72 percent versus 69 percent).

Selected characteristics of drivers in injury crashes are reported in Tables 6 and 7. The data are from a subset of 208,355 injury-producing red light running crashes that had two drivers, both of whom were going straight ahead, and only one of whom met the definition of a red light runner. This set of crashes comes from 1994-96 and represents 61 percent of all GES red light running injury crashes during this period.

Table 6

Drivers in Red Light Running Injury Crashes (Percent)

	Runners (N=208,355)	Non-Runners (N=208,355)
Male	58*	54
Female	42	46
Age		
<20	13	8
20–29	30	25
30–39	20	23
40–49	15	19
50–59	9	12
60–69	7	8
70–79	5	5
≥80	2	1
Vehicle Role in Crash		
Striking	62	40
Struck	38	60
Police Reported Alcohol	5	<1

Distributions of runners and non-runners differed significantly at p<.01, except where noted by (*).

Red light runners in injury crashes were more likely than non-runners to be younger than age 30 (43 percent versus 33 percent) and were somewhat more likely than other crash-involved drivers to be male (58 percent versus 54 percent). Age distributions of red light runners and non-runners in injury crashes are similar to those found in fatal crashes. The types of vehicles driven by red light runners and non-runners did not differ appreciably.

Table 7

Red Light Runners in Injury Crashes by Age Group (Percent)

	Age < 20 (n=28,834)	Age 20–69 (n=184,486)	Age ≥ 70 (n=15,879)
Male	54	58	55
Female	46	42	45
Vehicle Type			
Automobile	79	71	88
Utility/Van	8	11	6
Pickup	10	14	5
Heavy Truck	1	2	<1
Motorcycle	<1	<1	0
Other	1	2	1
Police Reported Alcohol	2	6	1

About 5 percent of red light running drivers were reported to have been drinking alcohol (any amount) prior to the crash, compared with less than 1 percent of non-runners. For nighttime crashes, police reported alcohol involvement for 12 percent of red light runners and for 1 percent of non-runners. Chemical test data are not available in the GES database.

DISCUSSION

This study has shed light on the prevalence and characteristics of red light running crashes in the United States. It is clear from analyses of FARS and GES data that red light running crashes occur in very substantial numbers. Results confirm earlier findings that red light runners are a deviant population, more likely than non-runners to be alcohol-impaired and to have invalid licenses and prior violations. Results also show that red light running crashes differ markedly by time of day. Nighttime crashes are most likely to involve young, male drivers with poor driving records and alcohol impairment, with more than half the nighttime red light runners in fatal crashes having high BACs.

The frequency and severity of red light running crashes warrant considerable resources for remediation. Characteristics of these crashes and the drivers involved suggest a range of potential countermeasures.

Red light running and associated crashes may be reduced through improvements to the design and timing of traffic signals. These changes would primarily affect drivers who misjudge the change of the traffic signal from yellow to red (inadvertent red light running) or are unable to get through the intersection before the cross light has turned green. For example, increasing the intensity of traffic signal displays (which may be especially helpful for older drivers) was associated with reductions in daytime right-angle crashes (Greater London Road Safety Unit, 1974). Providing adequate signal change intervals (the brief yellow and all-red periods that separate conflicting traffic movements) can help. Stein (1986) reported that inadequate signal change intervals were associated with elevated crash rates. Retting and Greene (1997) reported that increases in the length of yellow signal timing toward values associated with an Institute of Transportation Engineers (ITE, 1985) proposed recommended practice significantly decreased the chance of inadvertent red light running.

Older drivers have been found to have both a significantly higher percentage of angle collisions than young or middle-aged drivers and higher crash involvements at intersections controlled by stop signs than by signals (McKelvey and Stamatiadis, 1989; Garber and Srinivasan, 1991). McKelvey and Stamatiadis also reported that older drivers are charged more often than drivers in other age groups for failing to yield the right-of-way. Although these findings suggest that older drivers generally may benefit from signal control, it is important to ensure that design features of traffic signal systems and intersection geometry are sensitive to the physical and psychomotor needs of older drivers. Such features include methods for separating left-turning vehicles from through traffic and provisions for adequate intersection sight distance (Federal Highway Administration, 1996).

Enforcing against deliberate red light violations is even more important. However, resources to enforce traffic laws are inadequate and have diminished over time in relation to the number of vehicles on the road (Freedman and Paek, 1992). Traditional police enforcement requires an officer to observe a red light violation and then chase, stop, and cite the violator. This process can endanger motorists, pedestrians, and officers at busy urban intersections. Red light cameras can help communities enforce traffic laws by automatically photographing the license plates of vehicles whose drivers run red lights. An evaluation of red light camera enforcement in a small California city found that within four months of its implementation, red light violation rates decreased 42 percent (Retting et al., 1998). Increases in driver compliance were not limited to camera-equipped sites but spilled over to nonequipped intersections as well. Nearly 80 percent of residents surveyed supported the camera enforcement program. Red light camera enforcement in Victoria, Australia, was associated with a 32 percent decrease in right-angle crashes (South et al., 1988).

Because drivers with invalid driver's licenses and high BACs frequently are involved in red light running crashes, targeting these behaviors through laws and their enforcement is important. Keeping drivers with invalid driver's licenses off the road is not easily accomplished, but in states where frontal photography is used for red light camera enforcement (e.g., Arizona), photos of drivers with suspended or revoked driver's licenses may prove useful in detecting these offenses.

Red light runners were more likely than other crash-involved drivers to be killed, especially older red light runners. Providing increased protection in side impact crashes also is important, especially for older drivers. In a study of two-vehicle side impact crashes, Farmer et al. (1997) reported that those age 65 or older are three to four times as likely as younger occupants to be seriously injured. Improved side impact protection including airbags are the primary vehicle design features for reducing injury severity in red light running crashes.

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