Unlicensed to Kill

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June 2000

Foreword

This study was funded by the AAA Foundation for Traffic Safety. Founded in 1947, the AAA Foundation is a not-for-profit, publicly supported charitable research and educational organization dedicated to saving lives and reducing injuries by preventing traffic crashes.

This peer-reviewed report documents the alarming numbers of fatal traffic crashes involving unlicensed drivers. It should be of interest to state legislators, licensing agencies, law enforcement officials, and traffic safety organizations. It is also available online at www.aaafoundation.org.

Funding for this study was provided by voluntary contributions from the American Automobile Association, the Canadian Automobile Association, and their affiliated motor clubs; from individual AAA members; and from AAA-club-affiliated insurance companies.

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Abstract

Five years of fatal traffic crash data (FARS 1993-1997) were analyzed to learn more about the license status of drivers involved in fatal crashes. This data set included 278,078 drivers who were involved in 183,749 fatal crashes. Of particular interest were drivers in three aberrant categories:

(1) drivers with an invalid license (i.e., a suspended, revoked, expired, or canceled/ denied license)—20,596 (7.4%);

(2) drivers with no known license —10,228 (3.7%); and

(3) drivers of unknown license status—7,632 (2.7%)

It was found that 20 percent of all fatal crashes—one fatal crash in five— involves at least one improperly licensed driver as defined above. Further analyses sought to show the involvement of these aberrant drivers in fatal crashes as a function of several variables: age, sex, vehicle type, previous DWI's, previous suspensions and revocations, and so forth.

A brief review of the literature considered three vehicle sanctions or modifications that have been developed to reduce unlawful driving: vehicle impoundment, electronic driver licenses, and ignition interlocks.

Introduction

The title of this report comes from "Unlicensed to Kill," a small article that appeared in the June 13, 1994 issue of *Time*. In that article, the following statistics were cited:

- ... 6,484 people in New York City have had their license suspended for the 20th time or more.
- In Southern California, which leads the U.S. in hit-and-run cases, police believe many of the people who flee the scene do so because they are driving without a license.
- More than 36,000 Texas drivers involved in accidents last year (1993) had no license.

Findings from the current study indicate that:

- Of the 278,078 drivers involved in fatal crashes in the United States between 1993 and 1997, 3.7 percent were unlicensed, 7.4 percent were driving on an invalid (e.g., suspended, revoked, etc.) license, and 2.7 percent were of unknown license status.
- 20 percent of all fatal crashes in the United States—one fatal crash in five—involves at least one driver who is unlicensed, driving on an invalid license, or of unknown license status.
- Between 1993 and 1997 some 42,049 people were killed in crashes involving at least one driver who was unlicensed, driving on an invalid license, or of unknown license status.

It is clear from these summary statistics that a large number of drivers in the United States are operating their vehicles without the benefit of a valid operator's license. Some have no license to drive while others are driving in defiance of state-imposed sanctions. Still others, often hit-and-run drivers, are of unknown license status.

In the paragraphs that follow, data collected on all fatal crashes recorded in the United States between 1993 and 1997 will be analyzed to define and describe those individuals who are involved in fatal traffic crashes but who do not have a valid operator's license. Subsequent to the presentation of these analyses, three vehicle sanctions or modifications that have been proposed to address the problem of "unlicensed drivers" (including drivers operating with suspended and revoked licenses) will be considered in light of the data presented.

Fatal Traffic Crashes in the United States

(FARS 1993-1997)

Between 1993 and 1997, some 279,537 vehicles were involved in fatal crashes in the United States. For 22 of these vehicles, driver presence was unknown. Another 1,437 vehicles were "driverless," defined as not having a person in the driver's seat who was operating the vehicle. ("Driverless" cars would include, for example, a parked car with someone sitting in the front seat .) For the remaining 278,078 vehicles, information was available about driver. The driver license status of these 278,078 drivers is reported in Table 1.[1] If a driver with a suspended or revoked license is in compliance with the restrictions on that license (e.g., "travel to and from work permitted") at the time of his or her fatal crash, that driver is coded as having a valid license. [*1993 FARS Coding and Validation Manual*, page 300] Of the 238,547 valid license holders in Table 1, 40 were operating under, and in compliance with, a suspended or revoked license at the time of their fatal crash.

Table 1: Vehicles and Drivers Involved in Fatal Crashes in the United States (1993-1997)

Vehicles	Number		License Status	Number	Percent
Driver Operated	276,577	278,078	Not Licensed	10,228	3.7
			Suspended	13,094	4.7
			Revoked	3,719	1.3
			Expired	3,348	1.2
Driver Left Vehicle at Scene	1,501		Canceled/Denied	435	0.2
			Valid	238,547	85.8
			Learner's Permit	951	0.3
			Temporary	124	0.0
			Unknown	7,632	2.7
Driverless	1,437	1,459			
Unknown	22				
Total	279,537	279,537	Total	278,078	100.0

[1]All fatal crash statistics cited in this report were produced from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS) for calendar years 1993-1997. License status (L_STATUS) refers to non-commercial driver license status. "This element (L_STATUS) is used to establish the driver's license status for all license classes except the commercial driver's license (CDL). It also captures the status of the non-CDL driving privilege for drivers with CDLs." [*1993 FARS Coding and Validation Manual*, page 299]

In Figure 1, “state” represents the state in which the fatal crash occurred. Of the 278,078 drivers who were involved in fatal crashes between 1993 and 1997, some 38,456 (13.8 percent) fell into one of three aberrant license categories:

(a) invalid license (i.e., a suspended, revoked, expired, or canceled/denied license),

(b) no license (i.e., no known record of having been licensed), or

(c) unknown license status.

State-to-state variation about this average figure of 13.8 percent ranges from 6.4 percent in Maine to 23.9 percent in New Mexico. Appendix A provides more detail on driver license status by the state in which the crashes occurred, including the percent of drivers who were not licensed; percent who were driving on valid, suspended, revoked, expired, canceled or denied, or temporary licenses or learner’s permits; and percent who were of unknown license status.

Table 2 shows how driver license status varies by vehicle type. Motorcyclists, for example, are about twice as likely as passenger car drivers to have a suspended or revoked license. Conversely, drivers of passenger vehicles are about seven times as likely to have a suspended or revoked license as drivers of combination vehicles. Appendix B provides more detail on the body types that constitute the eight vehicle types shown in Table 2. The “other or unknown” vehicle category in Table 2 is a potpourri of vehicle body types, including snowmobiles (273), farm equipment (537), construction equipment (115), etc., as well as 3,318 vehicles of unknown body type.

Table 3 (first row) indicates that 147,015 of the 183,749 fatal crashes recorded in the United States between 1993 and 1997 involved only *valid* license holders. Some of these 147,015 fatal crashes were single-vehicle crashes and some were multi-vehicle crashes, but all of the drivers in all of the crash-involved vehicles held valid licenses. The second row in Table 3 indicates that another 10,976 fatal crashes (six percent of all fatal crashes) involved only drivers with *invalid* (suspended, revoked, expired, or canceled/ denied) licenses. The great majority of these crashes involved a single vehicle, but some involved collisions between two or more drivers with invalid licenses, in other words, all of the drivers in these 10,976 crashes held invalid licenses. The last row in Table 3 depicts only three fatal crashes: All involved four or more vehicles (and drivers). At least one driver had a valid license, at least one had an invalid license, at least one was unlicensed, and at least one was of unknown license status.

Perhaps the most salient fact to be gleaned from Table 3 is that *20.0 percent of all fatal crashes and 20.4 percent of all fatalities involved at least one driver from an aberrant license category.* Without knowing the driving exposure (i.e., vehicle miles driven between) for the valid license holders and for the aberrant license groups, however, it is difficult to know if and to what degree aberrant drivers are overinvolved in fatal crashes. In the absence of any direct means for obtaining driving exposure for these different groups, DeYoung, Peck, and Helander (1997) have applied the method of quasi-induced exposure to six years of FARS data (1987-1992) to develop indirect, relativistic estimates of exposure for valid license holders, suspended and revoked drivers, and unlicensed drivers. From these estimates, they calculate that a driver with a suspended or revoked license is 3.7 times more likely to be involved in a fatal crash than a driver with a valid license and an unlicensed driver is 4.9 times more likely to be involved in a fatal crash than a driver with a valid license.

Figure 1: Percent of Drivers Who Were Driving with an Invalid License or No License, or Were of Unknown License Status, Ranked by State (FARS 1993-1997)

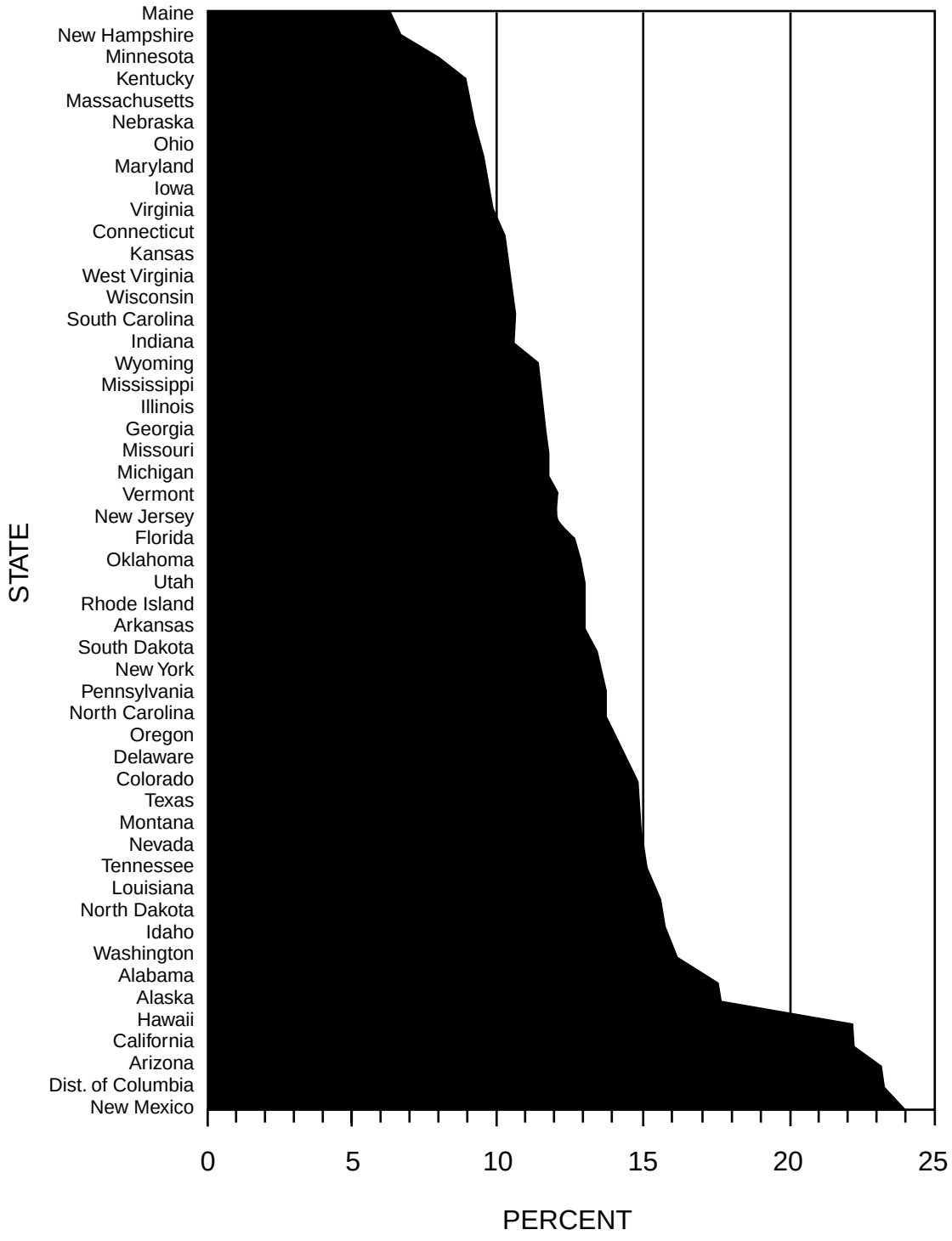

Table 2: Driver License Status by Vehicle Type (Expressed as Percentages of Vehicle Type)

License Status		Vehicle Type								Total Drivers
		Passenger Car	Pickup	Other Light Truck or Van	Combi-nation Truck	Single Unit Truck	Motor-cycle	Bus	Other or Unknown	
Not Licensed		4.4	2.8	2.9	0.1	0.6	5.3	0.1	8.8	10,228
Suspended		5.2	4.7	3.8	1.1	1.8	9.7	0.3	2.0	13,094
Revoked		1.5	1.6	0.9	0.1	0.4	2.5	.	1.0	3,719
Expired		1.3	1.3	1.0	0.3	0.3	2.1	0.1	0.9	3,348
Canceled or Denied		0.2	0.2	0.1	0.1	0.1	0.3	.	0.1	435
Valid		85.1	88.0	89.1	95.5	95.7	77.6	98.4	36.9	238,547
Learner's Permit		0.4	0.2	0.3	0.0	0.0	1.2	.	0.3	951
Temporary		0.1	0.0	0.0	0.0	0.0	0.1	.	0.1	124
Unknown		1.9	1.2	1.8	2.7	1.1	1.1	1.2	49.9	7,632
Total	Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
	Drivers	151,293	51,528	34,040	17,079	5,714	11,388	1,405	5,631	278,078

License status also varies by sex and age, as shown in Table 4. From the data in Table 4, the odds that a valid license holder involved in a fatal crash is a male are 2.68 to 1 (173,748 ÷ 64,741); the odds that a driver operating on a suspended license is a male are 6.40 to 1 (11,310 ÷ 1,768); the odds that a driver operating on a revoked license is a male are 9.80 to 1 (3,371 ÷ 344). Appendix C provides a table of license status by driver sex and age.

Of the eight license categories depicted in Table 4, valid license holders have the highest median age, 36.5 years, while drivers operating on a learner's permit, not surprisingly, have the lowest median age,18.1 years. Suspended and revoked license holders are somewhat younger than valid license holders, at 29.5 and 32.6 years, respectively. Unlicensed drivers are still younger, at 23.0 years. For over half of all drivers of unknown license status, no information on age or sex is available.[2]

[2]Age and sex were missing (i.e., not coded) for 361 of 278,078 drivers. For these 361 drivers, the missing codes were set to unknown ("unk") for purposes of the analyses contained herein.

Table 3: Fatal Crashes and Fatalities by Driver License Status of the Drivers Involved in the Crashes (FARS 1993-1997)

					Fatal Crashes		Fatalities	
Driver License Status for all Drivers Involved in Fatal Crashes					N	%	N	%
One or More Drivers from an Aberrant License Category	Valid[1]				147,015	80.0	164,352	79.6
	Invalid[2]				10,976	6.0	11,818	5.7
	Unlicensed				5,622	3.1	6,347	3.1
	Unknown				4,671	2.5	4,976	2.4
	Valid	Invalid			8,606	4.7	10,438	5.1
	Valid	Unlicensed			3,931	2.1	4,955	2.4
	Valid	Unknown			2,201	1.2	2,609	1.3
	Invalid	Unlicensed			259	0.1	318	0.1
	Invalid	Unknown			162	0.1	197	0.1
	Unlicensed	Unknown			101		138	0.1
	Valid	Invalid	Unlicensed		78		101	
	Valid	Invalid	Unknown		76	0.2	92	0.1
	Valid	Unlicensed	Unknown		44		52	
	Invalid	Unlicensed	Unknown		4		4	
	Valid	Invalid	Unlicensed	Unknown	3		4	
					183,749	100.0	206,401	100.0

[1]Includes valid licenses, temporary licenses, and learner's permits

[2]Includes suspended, revoked, expired, and canceled/denied licenses

Table 4: Driver License Status by Sex and Median Age

Driver License Status	Sex						Median Age (yrs)	Total Drivers
	Male		Female		Unknown			
	N	%	N	%	N	%		
Not Licensed	8,169	79.9	2,048	20.0	11	0.1	23.0	10,228
Suspended	11,310	86.4	1,768	13.5	16	0.1	29.5	13,094
Revoked	3,371	90.6	344	9.3	4	0.1	32.6	3,719
Expired	2,645	79.0	703	21.0	0	.	33.9	3,348
Canceled or Denied	373	85.8	61	14.0	1	0.2	32.4	435
Valid	173,748	72.8	64,741	27.1	58	0.1	36.5	238,547
Learner's Permit	656	69.0	295	31.0	0	.	18.1	951
Temporary	92	74.2	32	25.8	0	.	25.5	124
Unknown	2,694	35.3	537	7.0	4,401	57.7		7,632
Total	203,058		70,529		4,491			278,078

The next four figures depict the percentage distributions of drivers with valid licenses compared to drivers with suspended licenses (Figure 2), revoked licenses (Figure 3), expired licenses (Figure 4), and no licenses (Figure 5), by age. When compared to valid license holders, drivers with suspended, revoked, and expired licenses are overrepresented in fatal crashes involving drivers between 20 and 40 years of age (approximately). Unlicensed drivers are overrepresented in fatal crashes for drivers between 15 and 30 years of age (approximately).

Alcohol use is not reported or is unknown for many drivers in the FARS database. Nevertheless, the data in Table 5 clearly indicate that alcohol use (in the opinion of the investigating officer) is much more common among drivers who are not licensed or who are driving on invalid licenses than among properly licensed drivers. When the "not reported" and "unknown" categories are removed, 19.9 percent of valid license holders are seen to be under the influence of alcohol. For suspended, revoked, and expired license holders the percentages are 56.7, 74.1, and 50.7, respectively. For unlicensed drivers the figure is 31.1 percent.

Given the higher rates of alcohol involvement among invalid license holders , it is not surprising that relatively larger percentages of their crashes occur during hours of darkness when compared to valid license holders. The next five figures depict the percentage distributions of crashes by hour for drivers with valid licenses versus drivers with suspended licenses (Figure 6), revoked licenses (Figure 7), expired licenses (Figure 8), and no license (Figure 9), as well as drivers of unknown license status (Figure 10).

Figure 2: Percent of Crash-Involved Drivers with Suspended Licenses and Valid Licenses, by Age (FARS 1993-1997)

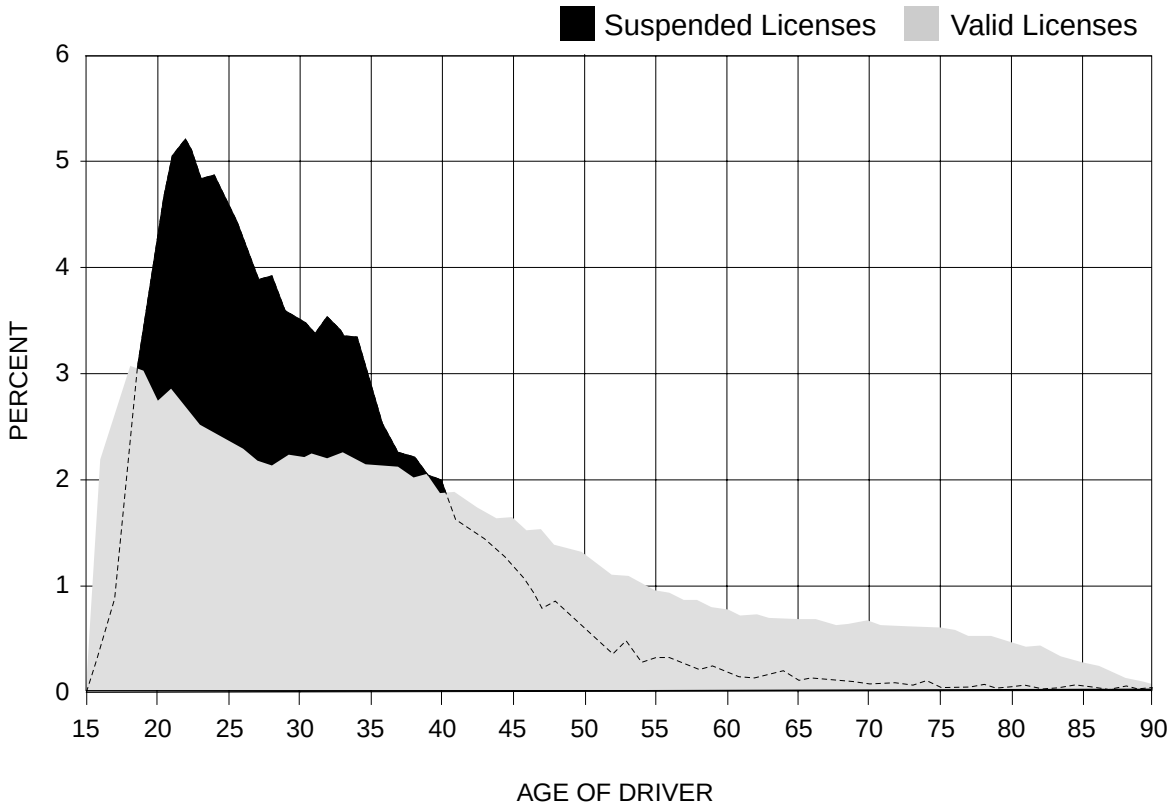

Figure 3: Percent of Drivers Who Were Driving with Revoked Licenses and Valid Licenses, by Age (FARS 1993-1997)

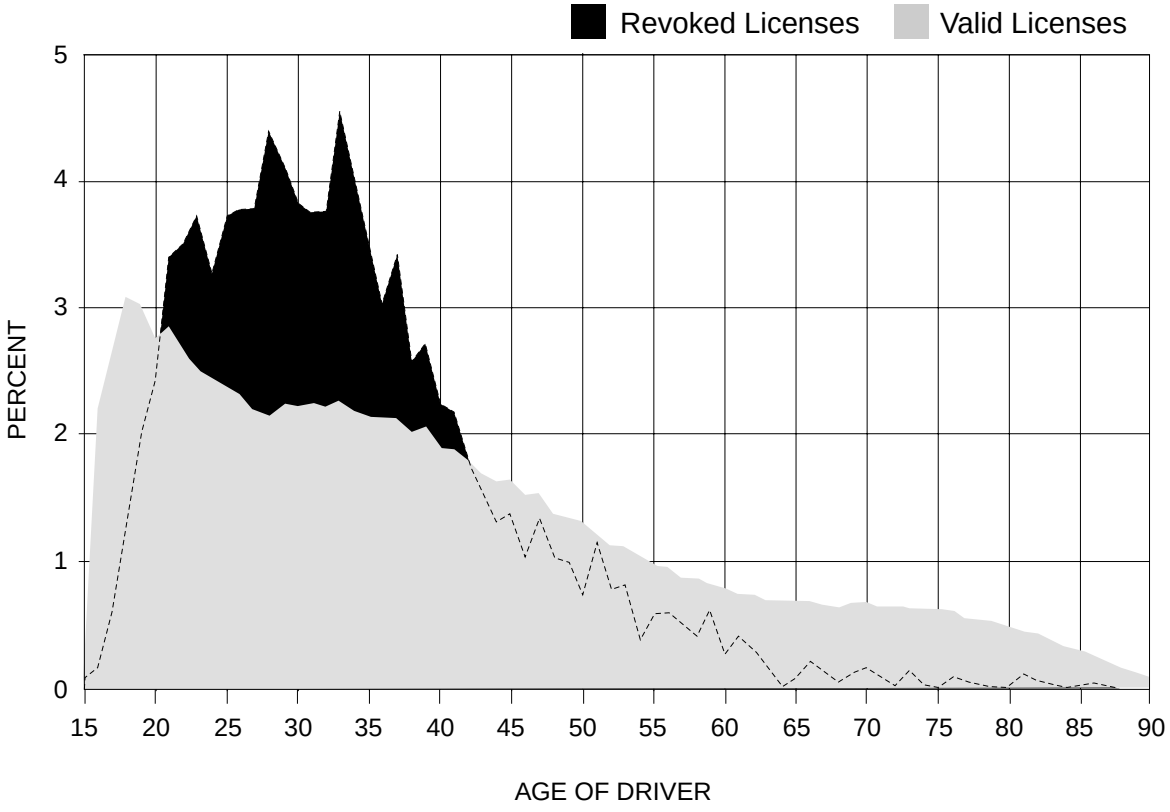

Figure 4: Percent of Crash-Involved Drivers with Expired Licenses and Valid Licenses, by Age (FARS 1993-1997)

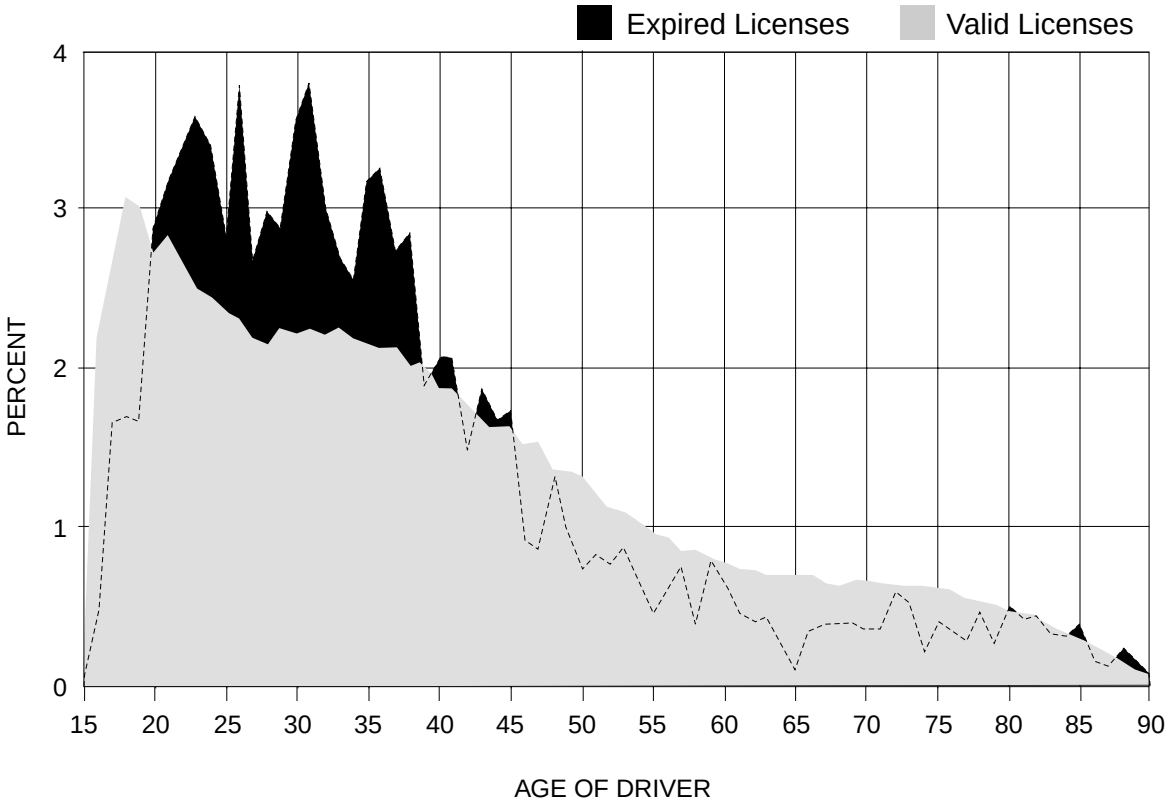

Figure 5: Percent of Drivers Who Were Driving without Licenses and with Valid Licenses, by Age (FARS 1993-1997)

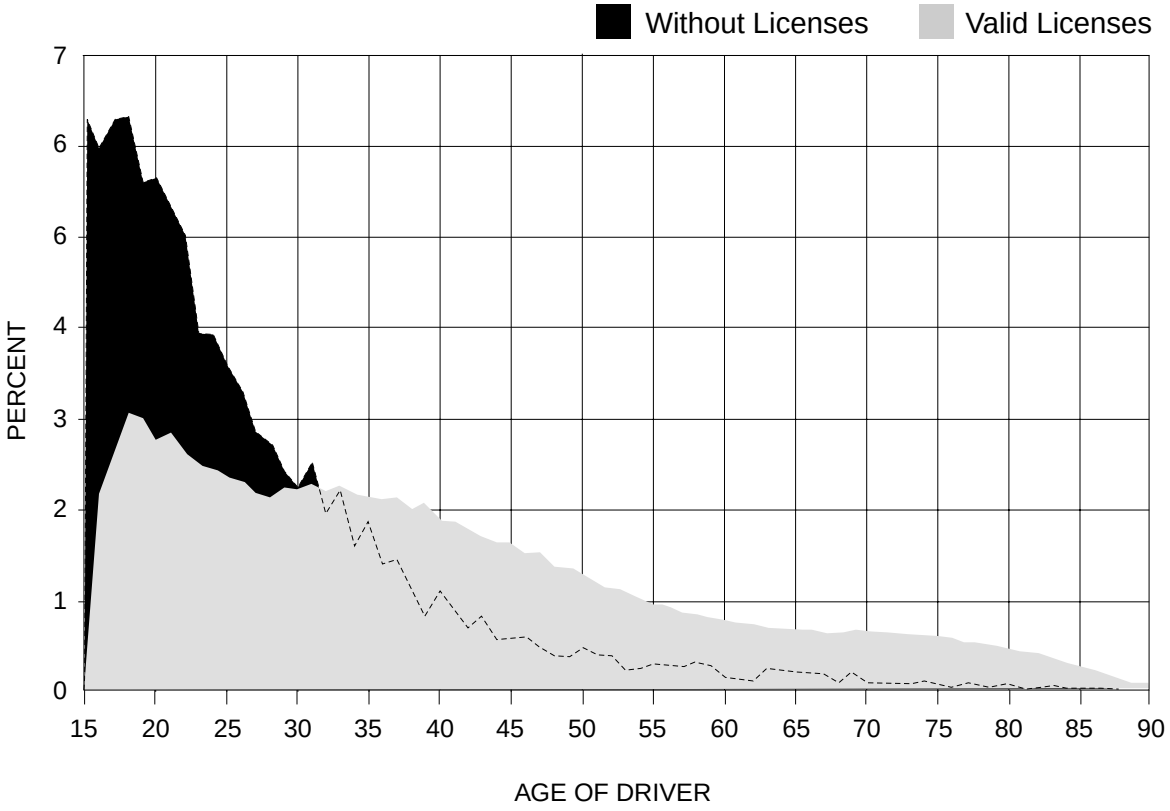

Figure 6: Percent of Crash-Involved Drivers with Suspended Licenses and Valid Licenses, by Hour (FARS 1993-1997)

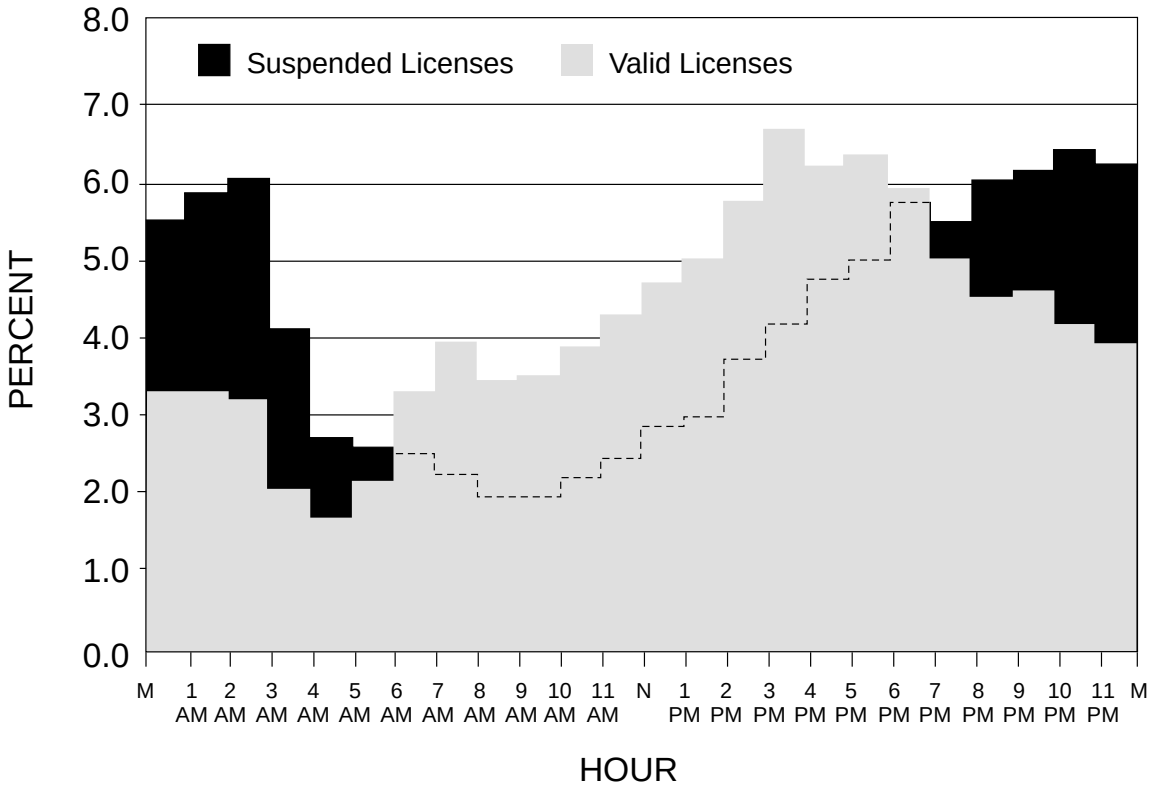

Figure 7: Percent of Drivers Who Were Driving with Revoked Licenses and Valid Licenses, by Hour (FARS 1993-1997)

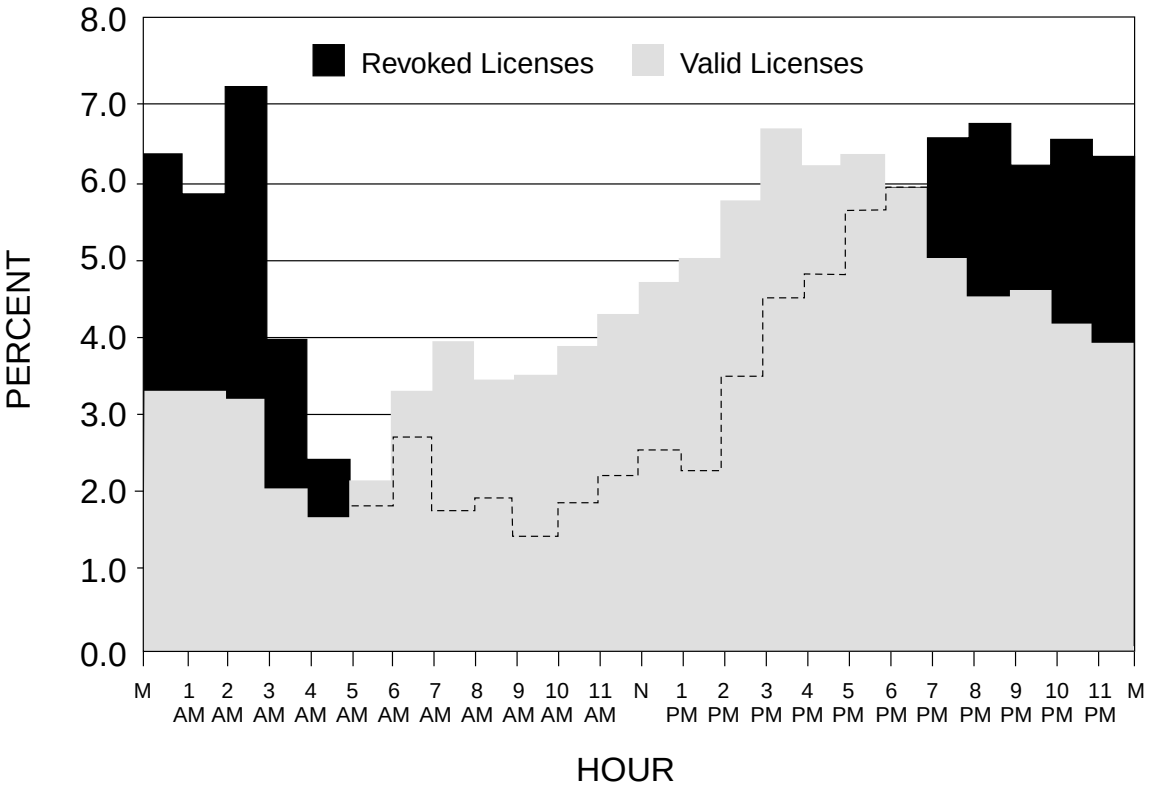

Figure 8: Percent of Crash-Involved Drivers with Expired Licenses and Valid Licenses, by Hour (FARS 1993-1997)

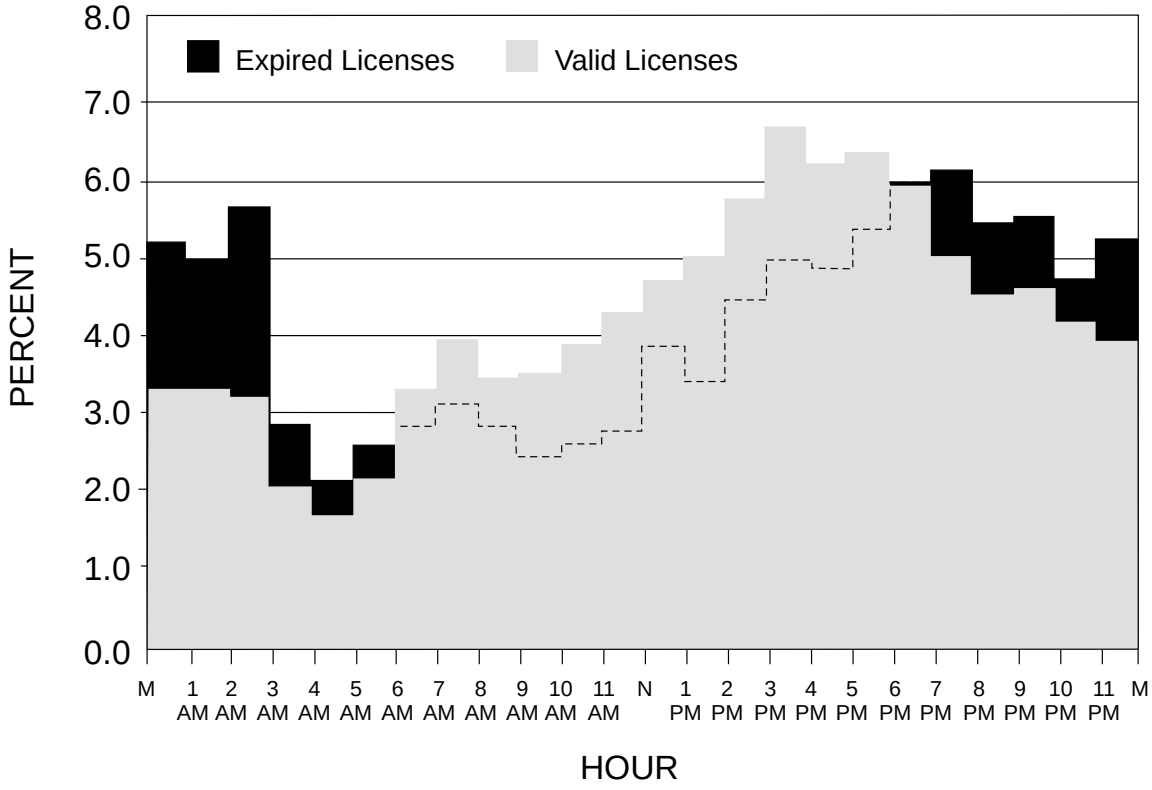

Figure 9: Percent of Drivers Who Were Driving without Licenses and with Valid Licenses, by Hour (FARS 1993-1997)

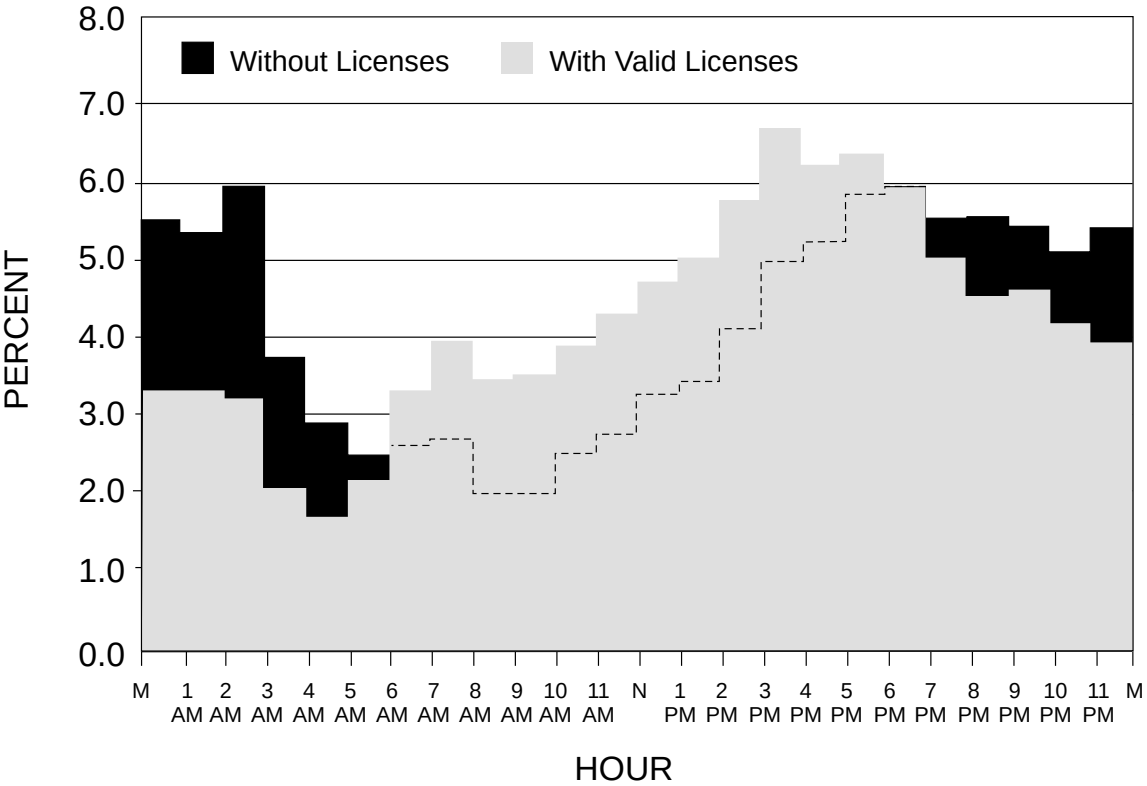

Figure 10: Percent of Crash-Involved Drivers of Unknown Licenses Status and with Valid Licenses, by Hour (FARS 1993-1997)

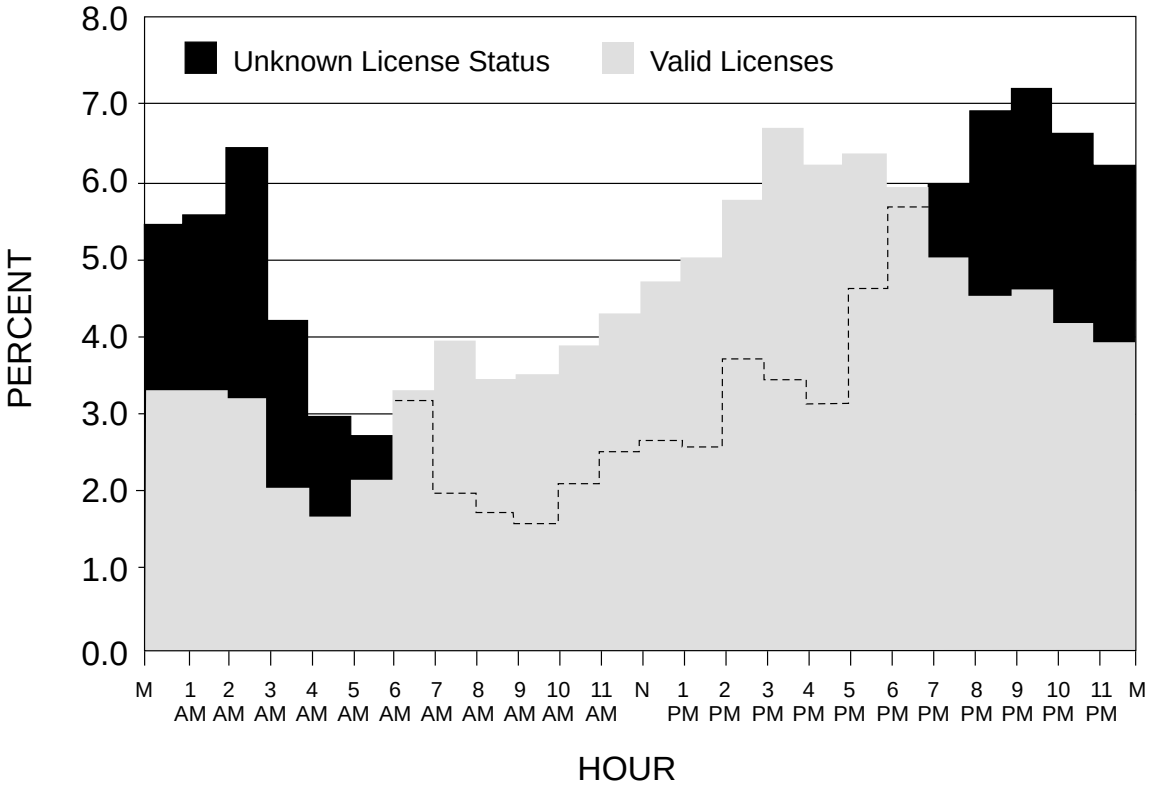

Table 5: Driver License Status by Presence of Alcohol (in the Opinion of the Investigating Officer)

Driver License Status	Had Been Drinking (Percent)				Total Drivers
	No	Yes	Not Reported	Unknown	
Not Licensed	33.5	30.3	20.5	15.7	10,228
Suspended	30.3	39.6	12.1	18.0	13,094
Revoked	18.3	52.3	11.6	17.8	3,719
Expired	32.9	33.9	19.8	13.4	3,348
Canceled or Denied	34.5	42.1	12.2	11.2	435
Valid	56.3	14.0	18.4	11.3	238,547
Learner's Permit	53.6	13.9	16.5	16.0	951
Temporary	72.6	19.4	4.5	3.2	124
Unknown	21.5	5.0	27.2	46.3	7,632
Total Drivers	145,776	45,498	50,937	35,867	278,078

Table 6: Driver License Status by Convictions for Driving While Intoxicated (DWI) in the Three Years Preceding the Fatal Crash

Driver License Status at Time of Fatal Crash	Pevious Convictions for DWI					Total Drivers
	None	1	2	3+	Unknown	
Not Licensed	83.46	1.77	0.27	0.12	14.38	10,228
Suspended	76.84	17.94	4.06	0.96	0.22	13,094
Revoked	57.03	29.36	10.27	3.20	0.13	3,719
Expired	93.19	4.99	0.84	0.15	0.84	3,348
Canceled or Denied	80.69	14.71	2.99	0.69	0.92	435
Valid	97.71	1.87	0.18	0.03	0.21	238,547
Learner's Permit	98.53	0.84	0.11	0.00	0.53	951
Temporary	93.55	4.84	1.61	0.00	0.00	124
Unknown	0.30	0.00	0.00	0.00	99.70	7,632
Total Drivers	258,340	8,323	1,419	337	9,659	278,078

Previous convictions for driving while intoxicated (DWI) are also more common for drivers operating on a suspended, revoked, or expired license (Table 6). Indeed, a conviction for DWI may have been the precipitating event that brought about a suspended or revoked license. Of the 13,094 suspended drivers in this study, 17.94 percent had been convicted of DWI once during the three-year period prior to their fatal crashes; 5.02 percent had been convicted of DWI two or more times during the same period. Of the 3,719 revoked drivers in this study, 29.36 percent had been convicted for DWI once and 13.47 percent had been convicted for DWI two or more times during the three-year period preceding their fatal crashes.

Previous suspensions and revocations (i.e., suspensions or revocations sustained in the three years immediately preceding involvement in a fatal crash) are depicted in Table 7. For drivers with valid licenses, 92.6 percent had not had their licenses suspended or revoked in the previous three years. Drivers who were driving on a suspended or revoked license at the time of their fatal crash were, by definition, likely to have received at least one suspension or revocation in the previous three years. However, the percent of drivers operating on suspended and revoked licenses who had sustained three or more suspensions in the three years prior to their fatal crashes is quite high, 26.4 percent and 34.3 percent, respectively.[3]

[3] Note that 17.4 percent of the drivers with suspended licenses had received no suspension or revocation in the three years prior to their fatal crashes. For drivers whose licenses had been revoked, the figure is 22.9 percent. These figures imply that the suspensions and revocations that were in effect at the time of the fatal crash were sustained more than three years prior to the fatal crashes.

Table 7: Driver License Status by Previous Suspensions and Revocations

Driver License Status at Time of Fatal Crash	Suspensions and Revocations in the Three (3) Years Prior to Driver Involvement in Fatal Crash (Percent)					Number
	None	1	2	3+	Unknown	
Not Licensed	77.9	2.9	1.6	3.2	14.4	10,228
Suspended	17.4	37.3	18.6	26.4	0.2	13,094
Revoked	22.9	24.6	18.1	34.3	0.1	3,719
Expired	82.5	8.3	3.3	5.1	0.8	3,348
Canceled or Denied	51.5	26.2	8.7	12.6	0.9	435
Valid	92.6	4.6	1.5	1.1	0.2	238,547
Learner's Permit	93.7	2.8	1.4	1.6	0.5	951
Temporary	85.5	11.3	1.6	1.6	.	124
Unknown	0.2	0.1	.	.	99.7	7,632
Total Drivers	235,955	17,497	7,013	7,954	9,659	278,078

Figure 11 shows the percent of fatal crash-involved drivers operating on suspended or revoked licenses who had received three or more suspensions or revocations in the three years preceding their fatal crashes, arranged by the driver's state of licensing. In Rhode Island, 3.1 percent of 32 drivers involved in fatal crashes while operating on suspended/revoked licenses had three or more suspensions or revocations during the previous three years. In Wyoming, the figure was 66.7 percent of 33 drivers. Why there was such great variability among the states is unknown. The observed differences may reflect inherent differences among the states in the use of driver license suspensions and revocations, or may result from inconsistencies in reporting across the states.

Appendix D provides a state-by-state breakdown of the numbers and percentages of license holders with valid, suspended, revoked, and expired licenses with multiple suspensions or revocations in the three years prior to their fatal crashes. For example, of the 256 crash-involved, suspended drivers licensed in Arkansas, 97 (37.9 percent) had received three or more license suspensions or revocations in the three years prior to their fatal crashes. Of the 347 Alabama drivers who were operating on a revoked license at the time of their fatal crashes, 190 (54.8 percent) had received three or more suspensions or revocations in the three years immediately preceding their fatal crashes.

Drivers of "unknown" license status are difficult to characterize. Many of the variables associated with drivers of unknown license status (e.g., age, sex, vehicle type, use of alcohol, previous suspensions or revocations, etc.) are simply not available for analysis. As the data in Table 8 show, about half of all drivers of unknown license status are "hit-and-run" drivers. Of the 7,632 drivers of unknown license status included in this study, 3,164 (41.4 percent) struck a pedestrian or other non-motorist and fled the scene. Another 649 (8.5 percent) struck another motor vehicle in transit and fled the scene.

Figure 11: Percent of Suspended and Revoked Drivers Who had Three or More Suspensions or Revocations in the Three Years Immediately Preceding Their Fatal Crashes, Ranked by License State

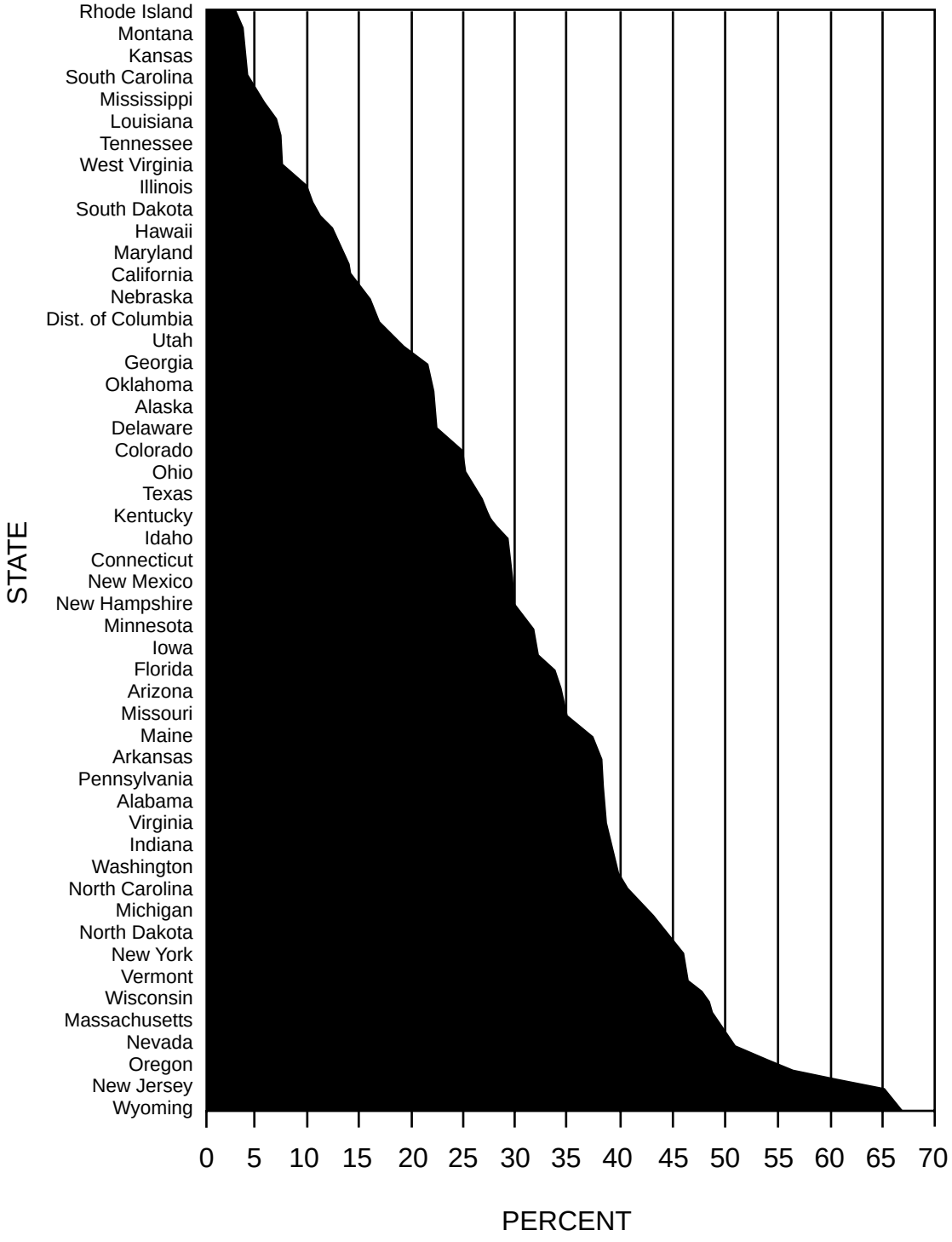

Table 8: Drivers of Unknown License Status by Hit-and-Run Involvement and Residence

Drivers of Unknown License Status	N	%
Hit-and-Run Drivers:	3,849	50.4
Hit Pedestrian or Non-Motorist	(3,164)	(41.4)
Hit Parked Vehicle or Object	(36)	(0.5)
Hit Motor Vehicle in Transport	(649)	(8.5)
Not Hit-and-Run Drivers:	3,783	49.6
Drivers from Other States	(599)	(7.8)
Drivers from State in Which Crash Occurred	(577)	(7.6)
Drivers from Puerto Rico	(4)	(0.1)
Drivers from Virgin Islands	(1)	-
Drivers in the Military	(4)	(0.1)
Drivers from Canada	(334)	(4.4)
Drivers from Mexico	(132)	(1.7)
Drivers from Other Countries	(293)	(3.8)
Drivers of Unknown State or Country	(1,839)	(24.1)
Total	7,632	100.0

Among drivers of unknown license status who were not hit-and-run drivers, the residence of 24.1 percent (1,839 of 7,632 drivers) was unknown. Another 7.8 percent (599) were residents of other states; 10.0 percent (764) were residents of Puerto Rico, the Virgin Islands, Canada, Mexico or some other county; and 7.6 percent (577) were residents of the state in which their fatal crash occurred.

Figure 5 showed that unlicensed drivers are typically young. Table 9 shows that between 1993 and 1997 some 163 children between 4 and 12 years of age and 3,401 teenagers between 13 and 19 were unlicensed drivers in fatal crashes. Of the 163 children shown in Table 9, 22 (13.5 percent) were operating passenger cars, 40 (24.5 percent) all terrain vehicles (ATVs), 33 (20.2 percent) motorcycles, and 39 (23.9 percent) other vehicles. Of the 3,401 teenagers shown in Table 9, 2,225 (65.4 percent) were operating passenger cars, 409 (12.0 percent) pickups, 316 (9.3 percent) other light trucks or vans, and 222 (6.5 percent) motorcycles. Of the 163 child drivers, 122 (74.8 percent) were killed; of the 3,401 teenage drivers, 1,664 (48.9 percent) were killed.

Table 9: Young, Crash-Involved, Unlicensed Drivers by Age (4 - 19 years) and Vehicle Type or Body Type

	Driver Age (yrs)																
Vehicle/Body Type	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**Total**
Passenger Car	0	0	0	0	0	1	1	3	17	57	176	360	377	416	442	397	2,247
Pickup	0	0	0	0	0	1	2	6	6	19	50	77	63	83	66	51	424
Other Light Truck or Van	0	0	0	0	0	1	1	2	2	15	33	59	67	54	44	44	322
Single Unit Truck	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4
Motorcycle	0	0	0	2	0	1	6	9	15	25	38	45	25	21	38	30	255
All Terrain Vehicle (ATV)	2	1	0	1	1	4	7	9	15	22	39	31	22	6	3	3	166
Snowmobile	0	0	0	0	0	0	0	0	3	5	8	3	2	0	0	1	22
Farm Equipment	0	0	0	0	0	0	1	2	2	1	3	6	2	3	2	0	22
Construction Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Other Vehicle	0	1	2	2	4	7	10	6	7	4	15	16	2	3	1	0	80
Unknown	0	0	0	0	0	0	0	0	0	2	1	3	4	7	3	1	21
Total Drivers	2	2	2	5	5	15	28	37	67	151	363	600	564	596	599	528	3,564
Deceased Drivers	2	1	1	5	4	13	23	25	48	93	214	302	261	273	270	251	1,786

Finally, Table 10 shows drivers killed in fatal crashes by driver license status and crash type (single-vehicle crashes vs. multi-vehicle crashes). For example, of 2,094 drivers operating on a revoked license and involved in a fatal, single-vehicle crash, 1,495 (71.4 percent) were killed. Of 4,413 drivers of unknown license status involved in fatal, single-vehicle crashes, only 623 (14.1 percent) were killed. Most of the people killed in single-vehicle crashes with drivers of unknown license status are pedestrians. In multi-vehicle crashes, we again see that only a small percentage of drivers of unknown license status are killed (18.5 percent). Again, these are the drivers who are most apt to be involved in hit-and-run crashes.

Synopsis of Findings on Driver License Status

(FARS 1993-1997)

Perhaps the most surprising observation to come out of these analyses is the fact that one fatal crash in five in the United States involves one or more drivers from some aberrant license category – e.g., drivers with suspended, revoked, expired, canceled or denied licenses; unlicensed drivers; and drivers of unknown license status. Moreover, the aberrant licensees tend to be younger, more often male, more apt to have been involved in a fatal crash during hours of darkness, more apt to have been driving while intoxicated, more apt to have been recently convicted of DWI, and more apt to have received several (3+) recent suspensions or revocations. Table 11 is a summary table that depicts the relative likelihood (RL) that a randomly selected aberrant driver exhibits a given condition or characteristic when compared to a randomly selected driver with a valid license. A value greater than 1.00 indicates that an aberrant driving category (e.g., suspended drivers) is more likely (than valid license holders) to exhibit a given condition or characteristic.

Table 10: Driver Fatalities by Driver License Status and Crash Mode (Single Vehicle Crashes vs. Multi-Vehicle Crashes)

Driver License Status	Single Vehicle Crashes				Multi-Vehicle Crashes				
	Fatality		Non-Fatality		Fatality		Non-Fatality		
	N	%	N	%	N	%	N	%	N
Not Licensed	3,154	57.7	2,301	42.3	2,149	44.9	2,633	55.1	10,228
Suspended	4,271	63.6	2,442	36.4	2,914	45.7	3,467	54.3	13,094
Revoked	1,495	71.4	599	28.6	778	47.9	847	52.1	3,719
Expired	1,055	66.6	530	33.4	923	52.4	840	47.6	3,348
Canceled or Denied	137	69.2	61	30.8	107	45.1	130	54.9	435
Valid	46,246	55.7	36,759	44.3	55,473	35.7	100,069	64.3	238,547
Learner's Permit	221	48.4	236	51.6	204	41.3	290	58.7	951
Temporary	39	61.9	24	38.1	27	44.3	34	55.7	124
Unknown	623	14.1	3,790	85.9	594	18.5	2,625	81.5	7632
Total Drivers	57,232	55.0	46,742	45.0	63,169	36.3	110,935	63.7	278,078

A value less than 1.00 indicates that an aberrant driving category is less likely than valid license holders to exhibit a given condition or characteristic.[1]

Of the five groups of drivers shown in Table 11, the drivers operating on revoked licenses may be the most divergent from valid license holders. Compared to valid license holders, they are 1.32 times more likely to be under 40, 1.24 times more likely to be male, 3.72 times more likely to be driving while intoxicated in the opinion of the investigating officer, 20.48 times more likely to have been convicted of a DWI in the three years prior to their fatal crash, 30.95 times more likely to have received three or more suspensions or revocations in the three years prior to their fatal crash, 4.36 times more likely to be hit-and-run drivers, 0.82 times as likely to have carried out an avoidance maneuver such as braking or steering prior to their fatal crash, 1.50 times more likely to have been involved in a fatal crash between 6:00 pm and 5:59 am, 1.09 times more likely to have been involved in a fatal crash in a rural area, 1.62 times more likely to have been involved in a single-vehicle crash, 1.17 times more likely to be the striking vehicle in a two-vehicle crash, and 2.09 times more likely to be riding a motorcycle at the time of a fatal crash.[2]

Table 11: Relative Likelihood that Five Aberrant Driver License Categories (Suspended, Revoked, Expired, Unlicensed, and Unknown) Exhibit Conditions and Characteristics that Deviate from Valid Licensee Holders

Conditions and Characteristics		License Status				
		Suspended	Revoked	Expired	Unlicensed	Unknown
Driver Variables	Drivers < 40 year of age	1.42	1.32	1.17	1.53	-
	Male Drivers	1.19	1.24	1.08	1.10	-
	Driving While Intoxicated (DWI)	2.84	3.72	2.55	2.39	-
	Conviction for DWI within Three Years of Fatal Crash	11.07	20.48	2.89	1.21	-
	3+ Suspensions or Revocations in Last Three Years	23.87	30.95	4.64	3.35	-
	Hit-and-Run Driver	4.63	4.36	3.14	5.29	66.36
	Avoidance Maneuver (Braking, Steering, etc.)	**1.02**	0.82	**0.95**	0.91	0.66
Crash Variables	Crashes from 6:00pm to 5:59 am	1.44	1.50	1.29	1.35	1.52
	Crashes in Rural Areas	0.89	1.09	0.97	0.93	0.68
	Single Vehicle Crashes (One Vehicle Form Submitted)	1.47	1.62	1.36	1.53	1.66
Vehicle Variables	Striking Vehicle (in Two-Vehicle Crashes)	1.11	1.17	1.04	**0.98**	1.05
	Motorcycle	2.27	2.09	1.95	1.60	0.43

Note: The three bold, underlined values in this table are not significantly different from 1.0 at " = 0.05. All other values are significantly different from 1.0 at " = 0.05.

[4] Appendix E provides more detail on estimates of relative likelihood (RL) and tests of significance for estimates of RL.

[5] In reading Table 11, it should be clearly understood that the different values provided are not necessarily independent. For example, drivers operating on revoked licenses are 1.32 times as likely as valid license holders to be under the age of 40. Therefore, it is perhaps not too surprising that they are also 2.09 times as likely to be riding a motorcycle in a fatal crash as drivers with valid licenses. Motorcycle riding is relatively more common in younger individuals.

Drivers operating on suspended licenses appear to track pretty well with drivers operating on revoked licenses, though they may be somewhat less deviant. Compared to valid license holders, they are 1.42 times more likely to be under 40, 1.19 times more likely to be male, 2.84 times more likely to be driving while intoxicated, 11.07 times more likely to have been convicted of a DWI in the three years prior to their fatal crash, 23.87 times more likely to have received three or more suspensions or revocations in the three years prior to their fatal crash, 4.63 times more likely to be hit-and-run drivers, 1.44 times more likely to have been involved in a fatal crash between 6:00 pm and 5:59 am, 0.89 times as likely to have been involved in a fatal crash in a rural area, 1.47 times more likely to have been involved in a single-vehicle crash, 1.11 times more likely to be the striking vehicle in a two-vehicle crash, and 2.27 times more likely to be riding a motorcycle at the time of a fatal crash.

Drivers with expired licenses may fall somewhere between drivers with suspended licenses and valid license holders. Compared to valid license holders, they are 1.17 times more likely to be under 40, 1.08 times more likely to be male, 2.55 times more likely to be driving while intoxicated, 2.89 times more likely to have been convicted of a DWI in the three years prior to their fatal crash, 4.64 times more likely to have received three or more suspensions or revocations in the three years prior to their fatal crash, 3.14 times more likely to be hit-and-run drivers, 1.29 times more likely to have been involved in a fatal crash between 6:00 am and 5:59 pm, 0.97 times as likely to have been involved in a fatal crash in a rural area, 1.36 times more likely to have been involved in a single-vehicle crash, 1.04 times more likely to be the striking vehicle in a two-vehicle crash, and 1.95 times more likely to be riding a motorcycle at the time of a fatal crash.[6]

Drivers without a valid license are the youngest of the five groups considered in Table 11. Some 3,564 (34.8 percent) of all unlicensed drivers are under 20 years of age (Table 9). Because these drivers are young, they may have had relatively fewer years to chalk up previous convictions for DWI or previous license suspensions or revocations. On the other hand, compared to valid license holders they are 2.39 times more likely to be driving while intoxicated, 1.21 times more likely to have been convicted of a DWI in the three years prior to their fatal crash, 3.35 times more likely to have received three or more suspensions or revocations in the three years prior to their fatal crash, and 5.29 times more likely to be hit-and-run drivers.

As previously stated, the available information for drivers of unknown license status is sparse. About half of these drivers are hit-and-run drivers who fled the scene of their fatal crash (Table 8). Compared to valid license holders, they are 66.36 times more likely to be hit-and-run drivers. Understandably, they are more apt to be involved in single vehicle crashes (1.66), less apt to be involved in fatal crashes in rural areas (0.68), and less apt to be riding a motorcycle (0.43).

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[6] Drivers with expired licenses may be a more heterogeneous group than drivers with suspended or revoked licenses. Note in Figure 4 that there are relatively more drivers with expired licenses in their 60s, 70s and 80s than was the case for drivers with suspended or revoked licenses. Many of the older drivers may be former valid license holders who failed for whatever reasons to renew their licenses. Many of the younger drivers, however, may have failed to renew or reapply for licenses following license suspensions or revocations (Healy and Harrison, 1986; Ross and Gonzales, 1988). If drivers operating on expired licenses really are some amalgam of former valid license holders and former suspended and revoked drivers, the values in Table 11 are quite reasonable.

Vehicle Sanctions and Modifications to Restrain Unlawful Driving

The penalties imposed on individuals for unlawful driving (e.g., driving while intoxicated, reckless driving, driving without a license, or driving on a suspended or revoked license) run the gamut from traffic fines to protracted periods of incarceration—with counseling, remedial education and training programs, community service, and driver license sanctions falling somewhere in between. The seriousness of the unlawful driving act and the number of times an individual has been convicted of the same or similar acts in the past are, presumably, predictors of the severity of the penalty that is meted out.

Through both administrative and judicial procedures, driver license suspensions and revocations are prescribed to curtail driving and deter future traffic violations and crashes.[7] The literature strongly suggests that these measures, driver license suspensions and revocations, can indeed be effective means of reducing both traffic violations and traffic crashes (Hagen, 1977; Jones, 1987). Furthermore, license suspensions and revocations have generally been shown to be more efficacious and less costly than driver interviews, administrative hearings, and remedial programs (McKnight and Edwards, 1987; McKnight and Tippetts, 1997). Nevertheless, the literature also acknowledges that drivers with suspended and revoked licenses often drive in spite of their suspensions and revocations (Coppin and van Oldenbeek, 1965; Kaestner and Speight, 1974; Jones, 1987; Staplin, Knobel, Fischer, Gilfillan, and Grimm, 1989; Duncan, Clifford, and Matsui, 1991; Streff and Eby, 1994). Logically then, to the extent that license suspension and revocation are effective in reducing traffic violations and traffic crashes: “Driving is not eliminated, but it is modified, specifically reduced in quantity, and improved in quality.” (Ross and Gonzales, 1988, p. 387).

Given that 30 to 70 percent of those drivers whose licenses have been suspended or revoked may continue to drive (Streff and Eby, 1994), and given that many of these drivers become involved in serious injury and fatal crashes,[8] more stringent measures to curtail the risks posed by these drivers seem warranted, i.e., “... it is clear that there is considerable room for improvement” (DeYoung, 1997). Or, as AAMVA recommended in 1979, “An effective means must be found of coping with the problem of S/R (suspended and revoked) drivers continuing to drive” (AAMVA, 1979, p 28).

To some, the best way to deal with drivers who are driving without licenses, or driving with suspended or revoked licenses, is to “engineer around” the problem. Rather than attempting to modify unlawful driving behavior, a better solution may be found in vehicle sanctions or modifications that physically impede unlawful driving through vehicle impoundment, electronic drivers licenses, or alcohol ignition interlocks.

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[7] In California, for example, it is estimated that about 5.5 percent of all drivers in the state have suspended or revoked licenses (DeYoung et al., 1997).

[8] In a typical year in the United States, over 3,350 drivers operating on suspended or revoked licenses are involved in fatal crashes (Table 1).

Vehicle Impoundment

Perhaps the most dramatic vehicle sanction imposed on a driver is impoundment. This simple, low-technology strategy renders the vehicle unavailable to the driver for a prescribed period of time. The most thorough evaluation of the benefits of vehicle impoundment to date is a California study by DeYoung (1997).

In January of 1995 a law went into effect in California that authorized the seizure and impoundment of vehicles operated by drivers with no license or with a suspended or revoked license for a period of 30 days. Vehicle impoundment was authorized even if the illegal driver was not the owner of the vehicle. At the end of the 30-day impoundment, the owner was obliged to pay the costs associated with impoundment to reclaim his or her vehicle.

The potential benefits of a vehicle impoundment law are basically two: (1) for a period of 30 days, impounded vehicles are unavailable to be driven by those without licenses or with suspended or revoked licenses, and (2) the inconvenience and cost associated with vehicle impoundment might have some residual deterrent effect that would curtail future illegal driving beyond the 30-day period that the vehicle was impounded.

To evaluate the effectiveness of the California law, DeYoung collected data from four California communities: Riverside, San Diego, Santa Barbara, and Stockton. Drivers who were convicted of driving without a license or of driving with a suspended or revoked license between January 1 and December 31 of 1995 and whose vehicles were impounded were included in the treatment group (N = 6,327). Drivers who were convicted of driving without a license or driving with a suspended or revoked license between January 1 and December 31 of 1994 and whose vehicles were not impounded (because the law had not yet taken effect) were included in the comparison group (N = 6,397).

The driving records of the 6,327 treatment drivers and 6,397 comparison drivers were reviewed for a period of one year following their convictions. The treatment and comparison groups were then compared on three measures: (1) convictions for driving without a license or driving with a suspended license during a one-year follow-up period; (2) convictions for any traffic violations during a one-year follow-up period; and (3) crashes during a one-year follow-up period. Analysis of covariance was used to adjust the data to account for inherent differences in the treatment and comparison groups (e.g., age, sex, and socio-economic characteristics, which were approximated by ZIP code) and then to estimate the subsequent conviction rates (1 and 2) and crash rates (3) just enumerated. The results of these analyses are provided in Table 12.

In the top panel of Table 12, it is estimated that first-time offenders in the comparison group received an average of 0.25092 convictions for unlicensed, suspended, or revoked driving in the one-year period following their conviction in 1994. First-time offenders in the treatment group received an average of 0.19115 convictions for unlicensed, suspended, or revoked driving in the one-year period following their conviction in 1995. Repeat offenders in the comparison group received an average of 0.31493 convictions for unlicensed, suspended, or revoked driving in the one-year period following their convictions in 1994 while repeat offenders in the treatment group received an average of 0.20724 convictions for unlicensed, suspended, or revoked driving in the one-year period following their convictions in 1995. Overall, those drivers whose vehicles were impounded were significantly less likely (at $\alpha = 0.0001$) to be subsequently convicted of driving without a license

Table 12: The Effectiveness of 30-Day Vehicle Impoundments in Reducing Subsequent Conviction Rates for Driving While Suspended and Driving While Unlicensed, Overall Traffic Conviction Rates, and Crash Rates, by First-Time vs. Repeat Offenders (from DeYoung, 1997)

Offender Status	Comparison Group	Treatment Group	Treatment Effect	Differential Effect for First-Time Offenders and Repeat Offenders
Subsequent Conviction Rates for Driving While Suspended or Driving While Unlicensed During a One-Year Follow-Up Period				
First-Time Offender	0.25092	0.19115	23.82%↓	pr< .05
Repeat Offender	0.31493	0.20724	34.19%↓	
Subsequent Conviction Rates for any Traffic Violations During a One-Year Follow-Up Period				
First-Time Offender	0.49498	0.40557	18.06%↓	Not Significant
Repeat Offender	0.62324	0.48404	22.34%↓	
Subsequent Crash Rates During a One-Year Follow-Up Period				
First-Time Offender	0.05450	0.04103	24.71%↓	Not Significant
Repeat Offender	0.07204	0.04498	37.56%↓	

or driving with a suspended or revoked license than were drivers in the comparison group. Furthermore, the treatment imposed (vehicle impoundment) had significantly different effects on repeat offenders (a 34.19 percent reduction in subsequent convictions) and first-time offenders (a 23.82 percent reduction in subsequent convictions).

In the middle panel of Table 12, vehicle impoundment was found to significantly reduce subsequent convictions for any traffic violation by between 18.06 and 22.34 percent (at $\alpha = 0.0001$). However, the effects of treatment are not significantly different for first-time offenders and repeat offenders; 18.06 and 22.34 are not significantly different in this analysis (at $\alpha = 0.05$).

Finally, in the bottom panel of Table 12, vehicle impoundment was found to significantly reduce subsequent traffic crashes by between 24.71 and 37.56 percent (at $\alpha = 0.0001$). However, the effects of treatment are not significantly different for first-time offenders and repeat offenders, i.e., 24.71 and 37.56 are not significantly different in this analysis (at $\alpha = 0.05$).

Three observations follow from the analyses performed by DeYoung:

- Impounding the vehicles of improperly licensed drivers for 30 days can reduce subsequent convictions and crashes. These reductions in subsequent convictions and crashes are statistically significant and of practical consequence.
- Vehicle impoundment in California is for a period of 30 days, but the analyses performed by DeYoung were on one year's worth of citations and crashes. Therefore, the benefits of vehicle impoundment are likely to result not just from diminished driving during the 30-day impoundment period but from diminished driving and/or more cautious driving during the 11 months following vehicle impoundment.

- Although the results of California's vehicle impoundment program are impressive, it should also be noted that during a one-year follow-up period, many unlicensed, suspended, and revoked drivers whose vehicles had been impounded for 30 days continued to drive; continued to be convicted of unlicensed driving and driving with a suspended or revoked license; and continued to be involved in crashes.

Electronic Drivers Licenses

If vehicle impoundment is a low-technology solution to the problem of unlawful driving, electronic drivers licenses (EDLs) are a decidedly high-technology alternative that is still in the conceptual and promotional stages of development.

An EDL is, basically, a "smart card," not unlike a bank card, that works in concert with an ignition interlock system and an on-board computer to verify a driver's identity and authorize vehicle operation (Goldberg, 1995). The EDL holds pre-recorded information about a driver, such as date of birth, license restrictions, license expiration date, driver picture, medical information, and the vehicle's on-board computer holds the identities of all authorized drivers for that vehicle. When a license is placed in an ignition slot, the on-board computer verifies that the card holder is authorized to operate the vehicle. Once verification is complete, ignition is accomplished through the push of a button. If any of the information on the EDL is not valid (e.g., the card holder is not an authorized driver, the license has expired, license restrictions are being violated, etc.) the vehicle will not start.

Once the validity of an EDL has been established and the driver is underway, the on-board computer will have the capability of storing various pieces of trip-related information such as time of day, location of the vehicle, duration of the trip, speed of the vehicle preceding a crash, and associating those pieces of information with the EDL proffered by the driver. If a driver on a restricted license is not allowed to travel during certain hours or beyond a prescribed distance from home or work, the on-board computer could, presumably, provide a record of violations.[9]

Goldberg (1995) believes that the validation and monitoring procedures described in the previous paragraphs "would prevent all illegal driving" (p 685), but such is not the case. Without some mechanism for assuring that the person behind the wheel is the same person whose EDL is inserted in the ignition card slot, EDLs could in many instances be circumvented. Without authentication (such as a thumb print), the unlicensed 16-year-old who "borrows" his father's EDL will have no difficulty starting the family sedan, or an abusive husband with a a restricted license could coerce his wife into letting him use her license to start their vehicle and thus keep violations from being monitored by the on-board computer. Without authentication, EDLs may curtail illegal driving, but they will certainly not "prevent all illegal driving."

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[9] There are many technical, operational, and legal hurdles that will have to be addressed before new model vehicles are designed to accommodate EDL systems. Foremost among these are the "big-brother" implications of on-board vehicle monitors.

Interestingly, Goldberg does suggest one form of validation that might be used with EDLs, namely, a breath test of blood alcohol concentration (BAC) to confirm that a driver is sober. If the license restrictions recorded on a driver's EDL require that he of she demonstrate their sobriety before driving, BAC testing could be incorporated into the EDL's validation procedure. If the driver's BAC were acceptable, the vehicle would start. If the BAC were not acceptable, the vehicle could not be started.

The alcohol ignition interlock that Goldberg describes as part of an EDL system is already being used as a stand-alone system with DWI probationers. The next section discusses the effectiveness of the alcohol ignition interlock.

Ignition Interlocks

The Department of Justice (DOJ) estimates that in 1997 there were approximately 454,500 individuals in the United States who were on probation for driving while intoxicated. The average DWI probationer had been drinking for at least three hours prior to his or her arrest and had reached an average blood alcohol concentration of 0.19 g/dl. One-third (32.7 percent) of these 454,500 probationers were repeat DWI offenders, but only 12.7 percent had had their driving restricted as a condition of probation (Maruschak, 1999). Assuming that only repeat DWI offenders had had their driving restricted by the courts, it follows that approximately 60 percent of all repeat DWI offenders [(32.7 - 12.7) ÷ 32.7] did *not* have their licenses suspended, revoked, or otherwise restricted.[10]

The analyses in this report indicate that a crash-involved driver operating on a suspended license is 2.84 times more likely to be driving while intoxicated than a valid license holder. For drivers with revoked licenses, the figure is 3.72. Drivers with suspended licenses are 11.07 times more likely than drivers with valid licenses to have been convicted of DWI during the three years immediately preceding their fatal crashes; that figure is 20.48 for drivers with revoked licenses. Drivers with suspended licenses are also 23.87 times more likely than validly licensed drivers to have received three or more suspensions or revocations in the three years leading up to their fatal crashes. For drivers with revoked licenses, the figure is 30.95.

In summary, the DOJ data indicate that many repeat DWI offenders are not having their licenses restricted and the FARS data indicate that drivers continue to drive and become involved in fatal crashes even after their licenses have been suspended or revoked.

One measure that has been advanced to prevent repeat DWI offenders from driving while under the influence of alcohol is the alcohol ignition interlock.

> *Alcohol ignition interlocks require the driver to provide a breath sample every time the individual attempts to start the automobile. If the driver has a measured blood alcohol content above a specified threshold value, the ignition is locked, thereby preventing operation of the vehicle. Recent advances in interlock technology, such as data recorders that provide program monitors with documentation*

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[10] It should be acknowledged that 13.2 percent of all DWI probationers "... were either confined or monitored, which included house arrest, electronic monitoring, curfews, and other restrictions of movements." (Maruschak, 1999, p 5)

of all attempts at tampering or circumvention, have been incorporated into interlock systems. Other measures, such as breath pulse codes (requiring the driver to provide a series of short and long breath pulses prior to a breath sample) and rolling retests (requiring repeated breath tests on a random interval after the vehicle has been successfully started) have provided further protection from circumvention. (Coben and Larkin, 1999, p 81)

In a systematic and rigorous review of the literature on the benefits of alcohol ignition interlocks, Coben and Larkin (1999) were able to find six articles that provided tenable estimates of the effectiveness of these devices in reducing re-arrests for DWI. Five of the six articles reviewed found that repeat DWI offenders whose vehicles were fitted with ignition interlocks were 15 to 67 percent less likely to be re-arrested for DWI than were comparable repeat DWI offenders whose vehicles were not fitted with ignition interlocks.

The authors conclude:

... (A)lcohol ignition interlock programs are an effective deterrent to DWI recidivism among high risk, multiple DWI offenders. This deterrent effect appears to last as long as they are physically applied to the automobile. The policy implications of these findings are clear and suggest that the use of ignition interlock programs for repeat DWI offenders should be expanded. While there is certainly a cost associated with the use of these devices, offenders can be required to assume these costs as part of their proscribed penalty. The interlock program can be one important aspect of an overall approach to identify and rehabilitate the repeat DWI offender. (Coben and Larkin, 1999, p 86)

The authors also recommend three further areas of research on alcohol ignition interlocks that appear warranted:

- Given the variability in the five available estimates of the effectiveness of ignition interlocks in reducing re-arrests for DWI (62, 67, 15, 60, and 64 percent), more work is needed to explain these differences and to identify those components of an ignition interlock program that promote its effectiveness.
- To date the benefits of ignition interlock programs have been expressed in terms of reductions in re-arrests for DWI. Future work should seek to assess the effectiveness of ignition interlocks in terms of “crash rates, alcohol-related crash rates, deaths and injuries.” (p 86)
- Finally, the residual effects of alcohol ignition interlocks should also be assessed. That is to say, do repeat offenders drive more “soberly” after the alcohol ignition interlocks have been removed from their vehicles? Or, do they revert to their former behavior of drinking and driving?

Concluding Comments

The analyses conducted in this study have shown that unlicensed drivers and drivers with suspended and revoked licenses are involved in thousands of fatal crashes each year. If DeYoung et al. (1997) are correct, unlicensed drivers may be 4.9 times more likely to be involved in fatal crashes than valid license holders. Drivers with suspended or revoked licenses may be 3.7 times more likely to be involved in fatal crashes than drivers with valid licenses.

Vehicle impoundment has been shown to be an effective program for reducing the violations and crashes associated with unlicensed driving and driving by suspended and revoked licensees. This countermeasure deserves to be considered for more widespread use, though it should be acknowledged that this countermeasure also has a down side: Vehicle impoundment reduces the mobility of the sanctioned driver, but it may also reduce the mobility of other family members.

The alcohol ignition interlock has also been shown to be an effective device for use with DWI probationers in reducing re-arrests for DWI. This countermeasure is deserving of more widespread use—and more research to determine if and to what degree this countermeasure reduces crashes, particularly alcohol-related crashes.

Finally, electronic drivers licenses (EDLs) are still in the early stages of development. The impediments to broad implementation of such systems are formidable. Nevertheless, even at this early stage in the evolutionary process, more thought should be given to the problem of driver authentication.

References

Abbreviations:

AAAM	Association for the Advancement of Automotive Medicine
AAMVA	American Association of Motor Vehicle Administrators
AAP	Accident Analysis and Prevention

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Appendix A: License Status of Drivers Involved in Fatal Crashes by the State in Which the Crash Occurred (FARS 1993-1997)

In this appendix Driver License Status (Not Licensed, Suspended, Revoked, Expired, Canceled or Denied, Valid, Learner's Permit, Temporary, Unknown) is depicted for each State (plus the District of Columbia) in which the crash occurred.

Note: A FARS driver who is driving on a suspended or revoked license at the time of his or her fatal crash, but is, nonetheless, in compliance with the provisions of his or her suspended or revoked license, is coded as having a valid license.

	LICENSE STATUS																			
	Not Licensed		Suspended		Revoked		Expired		Canceled or Denied		Valid		Learner's Permit		Temporary		Unknown		TOTAL	
State	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
AL	358	4.8	369	4.9	338	4.5	57	0.8	13	0.2	6168	82.2	32	0.4	.	.	167	2.2	7502	100.0
AK	35	6.7	13	2.5	26	5.0	5	1.0	2	0.4	421	81.1	7	1.3	.	.	10	1.9	519	100.0
AZ	411	6.6	358	5.8	54	0.9	102	1.6	18	0.3	4749	76.7	14	0.2	.	.	482	7.8	6188	100.0
AR	144	3.6	256	6.3	6	0.1	66	1.6	6	0.1	3508	86.9	5	0.1	1	0.0	44	1.1	4036	100.0
CA	1490	5.6	2196	8.2	211	0.8	692	2.6	7	0.0	20852	77.9	16	0.1	7	0.0	1305	4.9	26776	100.0
CO	153	3.8	161	4.0	135	3.4	56	1.4	22	0.6	3370	84.7	17	0.4	2	0.1	65	1.6	3981	100.0
CT	76	3.5	99	4.6	4	0.2	10	0.5	3	0.1	1922	89.4	4	0.2	.	.	31	1.4	2149	100.0
DE	26	2.9	25	2.8	24	2.7	4	0.5	8	0.9	749	84.9	3	0.3	2	0.2	41	4.6	882	100.0
DC	24	5.9	16	3.9	3	0.7	2	0.5	.	.	312	76.7	1	0.2	.	.	49	12.0	407	100.0
FL	481	2.5	1081	5.6	51	0.3	27	0.1	21	0.1	16863	87.0	61	0.3	1	0.0	793	4.1	19379	100.0
GA	276	2.7	551	5.3	74	0.7	75	0.7	10	0.1	9043	87.8	56	0.5	1	0.0	219	2.1	10305	100.0
HI	49	5.6	52	6.0	19	2.2	45	5.2	1	0.1	672	77.4	5	0.6	.	.	25	2.9	868	100.0
ID	61	3.9	83	5.3	10	0.6	27	1.7	.	.	1306	83.9	3	0.2	.	.	66	4.2	1556	100.0
IL	331	3.3	424	4.2	65	0.6	75	0.7	7	0.1	8931	88.2	17	0.2	2	0.0	274	2.7	10126	100.0
IN	96	1.4	380	5.6	3	0.0	91	1.3	7	0.1	5982	88.7	36	0.5	.	.	150	2.2	6745	100.0
IA	86	2.6	93	2.8	71	2.1	38	1.1	6	0.2	3007	90.2	1	0.0	.	.	33	1.0	3335	100.0

(Continued)

State	LICENSE STATUS																		TOTAL	
	Not Licensed		Suspended		Revoked		Expired		Canceled or Denied		Valid		Learner's Permit		Temporary		Unknown			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
AL	358	4.8	369	4.9	338	4.5	57	0.8	13	0.2	6168	82.2	32	0.4	.	.	167	2.2	7502	100.0
KS	77	2.5	148	4.9	29	1.0	38	1.3	3	0.1	2713	89.4	5	0.2	1	0.0	21	0.7	3035	100.0
KY	130	2.3	246	4.4	11	0.2	48	0.9	1	0.0	5108	90.6	17	0.3	1	0.0	76	1.3	5638	100.0
LA	160	2.8	400	7.1	39	0.7	109	1.9	4	0.1	4748	84.4	.	.	1	0.0	163	2.9	5624	100.0
ME	11	0.9	54	4.4	1	0.1	2	0.2	.	.	1130	93.1	6	0.5	.	.	10	0.8	1214	100.0
MD	67	1.5	42	0.9	98	2.2	.	.	1	0.0	4045	90.2	3	0.1	.	.	228	5.1	4484	100.0
MA	34	1.1	103	3.5	54	1.8	27	0.9	4	0.1	2671	90.0	21	0.7	.	.	54	1.8	2968	100.0
MI	245	2.3	401	3.8	53	0.5	281	2.7	2	0.0	9290	88.1	7	0.1	2	0.0	260	2.5	10541	100.0
MN	74	1.8	56	1.4	83	2.0	3	0.1	53	1.3	3746	91.5	18	0.4	.	.	62	1.5	4095	100.0
MS	353	6.6	138	2.6	20	0.4	69	1.3	2	0.0	4747	88.5	4	0.1	1	0.0	32	0.6	5366	100.0
MO	192	2.6	209	2.9	243	3.3	98	1.4	13	0.2	6383	87.9	20	0.3	.	.	101	1.4	7259	100.0
MT	80	6.4	33	2.6	28	2.2	32	2.5	2	0.2	1067	85.0	3	0.2	.	.	11	0.9	1256	100.0
NE	47	2.6	51	2.8	32	1.8	24	1.3	3	0.2	1599	89.0	30	1.7	.	.	10	0.6	1796	100.0
NV	90	4.4	96	4.7	38	1.9	23	1.1	8	0.4	1722	84.4	11	0.5	1	0.0	51	2.5	2040	100.0
NH	12	1.4	24	2.9	3	0.4	9	1.1	.	.	760	91.5	1	0.1	13	1.6	9	1.1	831	100.0
NJ	132	2.5	375	7.0	8	0.1	10	0.2	.	.	4699	87.7	10	0.2	.	.	123	2.3	5357	100.0
NM	221	7.9	196	7.0	68	2.4	31	1.1	5	0.2	2116	75.7	9	0.3	.	.	148	5.3	2794	100.0
NY	419	3.7	462	4.1	151	1.3	44	0.4	5	0.0	9573	85.1	155	1.4	3	0.0	438	3.9	11250	100.0
NC	326	3.3	294	3.0	517	5.3	96	1.0	10	0.1	8410	85.7	57	0.6	.	.	106	1.1	9816	100.0
ND	33	5.7	28	4.8	8	1.4	5	0.9	.	.	482	83.2	2	0.3	4	0.7	17	2.9	579	100.0
OH	95	1.0	399	4.1	5	0.1	246	2.5	90	0.9	8728	89.5	27	0.3	72	0.7	89	0.9	9751	100.0
OK	144	3.0	213	4.4	126	2.6	38	0.8	4	0.1	4141	86.5	27	0.6	1	0.0	93	1.9	4787	100.0
OR	148	4.4	215	6.3	38	1.1	35	1.0	6	0.2	2904	85.6	16	0.5	.	.	30	0.9	3392	100.0
PA	310	3.0	544	5.2	15	0.1	42	0.4	9	0.1	9001	85.7	64	0.6	1	0.0	516	4.9	10502	100.0
RI	16	3.5	24	5.3	3	0.7	5	1.1	2	0.4	396	87.0	.	.	.	.	9	2.0	455	100.0
SC	182	3.2	284	4.9	21	0.4	6	0.1	2	0.0	5158	89.3	2	0.0	.	.	119	2.1	5774	100.0
SD	48	5.2	35	3.8	9	1.0	19	2.0	2	0.2	794	85.6	7	0.8	3	0.3	11	1.2	928	100.0
TN	276	3.3	360	4.3	446	5.4	45	0.5	28	0.3	7021	84.7	16	0.2	.	.	99	1.2	8291	100.0
TX	1584	7.2	639	2.9	34	0.2	452	2.1	16	0.1	18607	84.8	70	0.3	1	0.0	549	2.5	21952	100.0

(Continued)

State	LICENSE STATUS																		TOTAL	
	Not Licensed		Suspended		Revoked		Expired		Canceled or Denied		Valid		Learner's Permit		Temporary		Unknown			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
UT	127	6.0	40	1.9	12	0.6	3	0.1	16	0.8	1839	86.7	4	0.2	.	.	79	3.7	2120	100.0
VT	9	1.4	45	7.2	6	1.0	2	0.3	1	0.2	546	87.1	5	0.8	.	.	13	2.1	627	100.0
VA	108	1.8	246	4.0	66	1.1	10	0.2	1	0.0	5482	89.8	22	0.4	.	.	173	2.8	6108	100.0
WA	185	4.2	264	6.0	113	2.6	60	1.4	5	0.1	3661	83.5	18	0.4	.	.	79	1.8	4385	100.0
WV	54	2.1	100	4.0	54	2.1	32	1.3	.	.	2247	89.3	4	0.2	2	0.1	24	1.0	2517	100.0
WI	123	2.5	133	2.7	186	3.7	29	0.6	4	0.1	4468	89.3	6	0.1	.	.	55	1.1	5004	100.0
WY	19	2.4	40	5.1	7	0.9	3	0.4	2	0.3	690	87.6	6	0.8	1	0.1	20	2.5	788	100.0
Total	10228	3.7	13094	4.7	3719	1.3	3348	1.2	435	0.2	238547	85.8	951	0.3	124	0.0	7632	2.7	278078	100.0

Appendix B: Types of Vehicles Involved in Fatal Crashes by State (FARS 1993-1997)

In this appendix eight Vehicle Types (Passenger Car, Pickup, Other Light Truck or Van, Combination Truck, Single Unit Truck, Motorcycle, Bus, and Other) are defined on the basis of FARS Body Type (BODY_TYP) and Trailing Vehicles (TOW_VEH), as per NHTSA (*FARS Analytical Reference Guide 1975-1998*).

For those Body Types that are distributed across two Vehicle Types (e.g., Combination Truck or Single Unit Truck) coding is based on the number of trailing units. If a truck (e.g., a single unit truck with a low gross vehicle weight rating) is not towing another unit (or information on a trailing unit is unknown), the vehicle is classified as a Single Unit Truck. If that same vehicle had been towing one to four other units, that vehicle (that single unit truck with a low gross vehicle weight rating) would have been classified as a Combination Truck.

	VEHICLE TYPE																TOTAL	
	Passenger Car		Pickup		Other Light Truck or Van		Combination Truck		Single Unit Truck		Motorcycle		Bus		Other			
BODY TYPE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Convertible	1277	0.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1277	0.5
2dr Sedan/HT/Coupe	52286	34.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	52286	18.8
3dr/2dr Hatchback	9528	6.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9528	3.4
4dr Sedan/HT	73425	48.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	73425	26.4
5dr/4dr Hatchback	2389	1.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2389	0.9
Station Wagon	6646	4.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6646	2.4
Hatchback/unk drs	285	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	285	0.1
Other auto	944	0.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	944	0.3
Unk auto type	3995	2.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3995	1.4
Auto Pickup	509	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	509	0.2
Auto Panel	9	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9	0.0
Large Limousine	.	.	.	.	.	.	.	.	.	.	.	.	.	.	26	0.5	26	0.0
3-Wheel Auto	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0.0	1	0.0
Compact Utility	.	.	.	.	12607	37.0	.	.	.	.	.	.	.	.	.	.	12607	4.5
Large Utility	.	.	.	.	2643	7.8	.	.	.	.	.	.	.	.	.	.	2643	1.0
Utility Station Wagon	.	.	.	.	1467	4.3	.	.	.	.	.	.	.	.	.	.	1467	0.5

(Continued)

	VEHICLE TYPE																TOTAL	
	Passenger Car		Pickup		Other Light Truck or Van		Combination Truck		Single Unit Truck		Motorcycle		Bus		Other			
BODY TYPE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Convertible	1277	0.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1277	0.5
Utility Unk Body	.	.	.	.	56	0.2	.	.	.	.	.	.	.	.	.	.	56	0.0
Minivan	.	.	.	.	8420	24.7	.	.	.	.	.	.	.	.	.	.	8420	3.0
Large Van	.	.	.	.	6875	20.2	.	.	.	.	.	.	.	.	.	.	6875	2.5
Step Van-Light	.	.	.	.	333	1.0	.	.	.	.	.	.	.	.	.	.	333	0.1
Van Motorhome	.	.	.	.	.	.	.	.	.	.	.	.	.	.	147	2.6	147	0.1
Van Schoolbus	.	.	.	.	40	0.1	.	.	.	.	.	.	.	.	.	.	40	0.0
Van Transitbus	.	.	.	.	33	0.1	.	.	.	.	.	.	.	.	.	.	33	0.0
Other Van type	.	.	.	.	281	0.8	.	.	.	.	.	.	.	.	.	.	281	0.1
Unknown Van type	.	.	.	.	342	1.0	.	.	.	.	.	.	.	.	.	.	342	0.1
Compact Pickup	.	.	20855	40.5	.	.	.	.	.	.	.	.	.	.	.	.	20855	7.5
Standard Pickup	.	.	29717	57.7	.	.	.	.	.	.	.	.	.	.	.	.	29717	10.7
Pickup w/Camper	.	.	500	1.0	.	.	.	.	.	.	.	.	.	.	.	.	500	0.2
Convertible Pickup	.	.	6	0.0	.	.	.	.	.	.	.	.	.	.	.	.	6	0.0
Unknown Pickup	.	.	450	0.9	.	.	.	.	.	.	.	.	.	.	.	.	450	0.2
Cab chassis Based	.	.	.	.	672	2.0	.	.	.	.	.	.	.	.	.	.	672	0.2
Truck Based Panel	.	.	.	.	2	0.0	.	.	.	.	.	.	.	.	.	.	2	0.0
Lt Truck Motorhome	.	.	.	.	.	.	.	.	.	.	.	.	.	.	22	0.4	22	0.0
Other Lt Conventional	.	.	.	.	13	0.0	.	.	.	.	.	.	.	.	.	.	13	0.0
Unk Lt Conventional	.	.	.	.	69	0.2	.	.	.	.	.	.	.	.	.	.	69	0.0
Unk Lt Vehicle	.	.	.	.	159	0.5	.	.	.	.	.	.	.	.	.	.	159	0.1
School Bus	.	.	.	.	.	.	.	.	.	.	.	.	555	39.5	.	.	555	0.2
X-country/Intercity	.	.	.	.	.	.	.	.	.	.	.	.	142	10.1	.	.	142	0.1
Transit Bus	.	.	.	.	.	.	.	.	.	.	.	.	502	35.7	.	.	502	0.2
Other Bus	.	.	.	.	.	.	.	.	.	.	.	.	112	8.0	.	.	112	0.0
Unknown Bus	.	.	.	.	.	.	.	.	.	.	.	.	94	6.7	.	.	94	0.0
Step Van-Heavy	.	.	.	.	.	.	33	0.2	136	2.4	.	.	.	.	.	.	169	0.1
SUT low GVW	.	.	.	.	.	.	90	0.5	745	13.0	.	.	.	.	.	.	835	0.3
SUT med GVW	.	.	.	.	.	.	136	0.8	909	15.9	.	.	.	.	.	.	1045	0.4
SUT hi GVW	.	.	.	.	.	.	446	2.6	3258	57.0	.	.	.	.	.	.	3704	1.3

(Continued)

	VEHICLE TYPE																TOTAL	
	Passenger Car		Pickup		Other Light Truck or Van		Combination Truck		Single Unit Truck		Motorcycle		Bus		Other			
BODY TYPE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
SUT unk GVW	.	.	.	.	.	.	50	0.3	442	7.7	.	.	.	.	.	.	492	0.2
Med/Hvy Motorhome	.	.	.	.	.	.	.	.	.	.	.	.	.	.	117	2.1	117	0.0
Truck/Tractor	.	.	.	.	.	.	16275	95.3	.	.	.	.	.	.	.	.	16275	5.9
Med SUT or Combination	.	.	.	.	.	.	3	0.0	13	0.2	.	.	.	.	.	.	16	0.0
Hvy SUT or Combination	.	.	.	.	.	.	8	0.0	30	0.5	.	.	.	.	.	.	38	0.0
Camper or Motorhome	.	.	.	.	.	.	.	.	.	.	.	.	.	.	184	3.3	184	0.1
Unknown Med/Hvy	.	.	.	.	.	.	37	0.2	181	3.2	.	.	.	.	.	.	218	0.1
Unknown Truck	.	.	.	.	28	0.1	1	0.0	.	.	.	.	.	.	.	.	29	0.0
Motorcycle	.	.	.	.	.	.	.	.	.	.	10817	95.0	.	.	.	.	10817	3.9
Moped	.	.	.	.	.	.	.	.	.	.	156	1.4	.	.	.	.	156	0.1
3-wheel MC/Moped	.	.	.	.	.	.	.	.	.	.	17	0.1	.	.	.	.	17	0.0
Offroad Mcycle	.	.	.	.	.	.	.	.	.	.	134	1.2	.	.	.	.	134	0.0
Other Motorcycle	.	.	.	.	.	.	.	.	.	.	118	1.0	.	.	.	.	118	0.0
Unk Motorcycle	.	.	.	.	.	.	.	.	.	.	146	1.3	.	.	.	.	146	0.1
ATV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	611	10.9	611	0.2
Snowmobile	.	.	.	.	.	.	.	.	.	.	.	.	.	.	273	4.8	273	0.1
Farm Equipment	.	.	.	.	.	.	.	.	.	.	.	.	.	.	537	9.5	537	0.2
Constr Equipment	.	.	.	.	.	.	.	.	.	.	.	.	.	.	115	2.0	115	0.0
Motorized Wheel Chair	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	0.1	5	0.0
Other Vehicle	.	.	.	.	.	.	.	.	.	.	.	.	.	.	275	4.9	275	0.1
Unknown Body Type	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3318	58.9	3318	1.2
TOTAL	151293	100.0	51528	100.0	34040	100.0	17079	100.0	5714	100.0	11388	100.0	1405	100.0	5631	100.0	278078	100.0

Appendix C: License Status of Drivers Involved in Fatal Crashes by Sex and Age
(FARS 1993-1997)

This appendix depicts license status of 278,078 crash-involved drivers by sex and age. Those drivers for whom sex and age codes were missing were forced into the unknown ("unk") category.

		LICENSE STATUS																		
		Not Licensed		Suspended		Revoked		Expired		Canceled or Denied		Valid		Learner's Permit		Temporary		Unknown		TOTAL
SEX	AGE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Male	<20	3272	32.0	1343	10.3	230	6.2	228	6.8	34	7.8	23258	9.7	415	43.6	32	25.8	243	3.2	29055
	20-29	2557	25.0	4583	35.0	1145	30.8	782	23.4	113	26.0	38777	16.3	162	17.0	19	15.3	591	7.7	48729
	30-39	1281	12.5	3213	24.5	1169	31.4	772	23.1	132	30.3	37885	15.9	39	4.1	19	15.3	481	6.3	44991
	40-49	491	4.8	1421	10.9	497	13.4	392	11.7	45	10.3	28744	12.0	23	2.4	13	10.5	321	4.2	31947
	50-59	262	2.6	429	3.3	223	6.0	182	5.4	15	3.4	18121	7.6	10	1.1	.	.	180	2.4	19422
	60-69	150	1.5	181	1.4	69	1.9	112	3.3	11	2.5	11894	5.0	2	0.2	3	2.4	123	1.6	12545
	70+	112	1.1	133	1.0	37	1.0	174	5.2	23	5.3	14997	6.3	5	0.5	6	4.8	106	1.4	15593
	Unk	44	0.4	7	0.1	1	0.0	3	0.1	.	.	72	0.0	.	.	.	.	649	8.5	776
Female	<20	826	8.1	178	1.4	18	0.5	58	1.7	7	1.6	9705	4.1	222	23.3	17	13.7	53	0.7	11084
	20-29	589	5.8	683	5.2	105	2.8	176	5.3	20	4.6	13052	5.5	46	4.8	4	3.2	146	1.9	14821
	30-39	365	3.6	581	4.4	135	3.6	214	6.4	16	3.7	13681	5.7	18	1.9	9	7.3	105	1.4	15124
	40-49	144	1.4	236	1.8	54	1.5	111	3.3	11	2.5	10124	4.2	7	0.7	.	.	75	1.0	10762
	50-59	54	0.5	55	0.4	21	0.6	52	1.6	2	0.5	6283	2.6	1	0.1	2	1.6	35	0.5	6505
	60-69	31	0.3	17	0.1	3	0.1	19	0.6	1	0.2	4749	2.0	1	0.1	.	.	29	0.4	4850
	70+	32	0.3	18	0.1	8	0.2	73	2.2	3	0.7	7137	3.0	.	.	.	.	29	0.4	7300
	Unk	7	0.1	.	.	.	.	.	.	1	0.2	10	0.0	.	.	.	.	65	0.9	83
Unk	<20	1	0.0	1	0.0	.	.	.	.	.	.	2	0.0	.	.	.	.	1	0.0	5
	20-29	.	.	.	.	.	.	.	.	1	0.2	1	0.0	.	.	.	.	2	0.0	4
	30-39	1	0.0	.	.	.	.	.	.	.	.	4	0.0	.	.	.	.	.	.	5
	40-49	.	.	.	.	.	.	.	.	.	.	1	0.0	.	.	.	.	1	0.0	2
	70+	.	.	.	.	.	.	.	.	.	.	1	0.0	.	.	.	.	.	.	1
	Unk	9	0.1	15	0.1	4	0.1	.	.	.	.	49	0.0	.	.	.	.	4397	57.6	4474
TOTAL		10228	100.0	13094	100.0	3719	100.0	3348	100.0	435	100.0	238547	100.0	951	100.0	124	100.0	7632	100.0	278078

Appendix D: Suspensions and Revocations Recorded for Drivers Involved in Fatal Crashes in the Three Years Preceding Their Fatal Crashes by License State, i.e., the State in Which They were Licensed
(FARS 1993-1997)

There are four tables in this appendix.

- Table 1: Number of Suspensions or Revocations for Drivers with **VALID** Licenses in the Three Years Preceding their Fatal Crashes, by License State
- Table 2: Number of Suspensions or Revocations for Drivers with **SUSPENDED** Licenses in the Three Years Preceding their Fatal Crashes, by License State
- Table 3: Number of Suspensions or Revocations for Drivers with **REVOKED** Licenses in the Three Years Preceding their Fatal Crashes, by License State
- Table 4: Number of Suspensions or Revocations for Drivers with **EXPIRED** Licenses in the Three Years Preceding their Fatal Crashes, by License State

Table 1: Number of Suspensions or Revocations for Drivers with VALID Licenses in the Three Years Preceding their Fatal Crashes, by License State

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
Alabama	5571	91.3	348	5.7	104	1.7	74	1.2	3	0.0	6100
Alaska	411	94.5	22	5.1	1	0.2	1	0.2	.	.	435
American Samoa	3	100.0	.	.	.	.	.	.	.	.	3
Arizona	4130	91.8	198	4.4	92	2.0	73	1.6	4	0.1	4497
Arkansas	3189	92.9	135	3.9	39	1.1	71	2.1	.	.	3434
California	20262	95.9	632	3.0	167	0.8	60	0.3	5	0.0	21126
Colorado	3227	94.7	129	3.8	29	0.9	14	0.4	7	0.2	3406
Connecticut	1803	91.9	86	4.4	31	1.6	24	1.2	18	0.9	1962
Delaware	678	91.9	43	5.8	11	1.5	4	0.5	2	0.3	738
Dist of Columbia	236	80.0	4	1.4	.	.	.	.	55	18.6	295
Florida	14826	87.0	1311	7.7	473	2.8	418	2.5	6	0.0	17034
Georgia	8154	91.9	564	6.4	104	1.2	50	0.6	2	0.0	8874
Hawaii	628	98.6	6	0.9	2	0.3	1	0.2	.	.	637
Idaho	1152	87.0	102	7.7	27	2.0	32	2.4	11	0.8	1324
Illinois	9191	97.6	187	2.0	25	0.3	4	0.0	9	0.1	9416
Indiana	5466	92.5	278	4.7	100	1.7	62	1.0	3	0.1	5909
Iowa	2880	94.0	135	4.4	31	1.0	14	0.5	4	0.1	3064
Kansas	2696	99.1	8	0.3	16	0.6	1	0.0	.	.	2721
Kentucky	4511	92.6	265	5.4	67	1.4	29	0.6	1	0.0	4873
Louisiana	4474	94.9	209	4.4	27	0.6	4	0.1	.	.	4714
Maine	956	87.0	65	5.9	34	3.1	25	2.3	19	1.7	1099
Maryland	3736	92.8	150	3.7	52	1.3	23	0.6	65	1.6	4026
Massachusetts	2254	82.2	251	9.2	94	3.4	108	3.9	34	1.2	2741
Michigan	8375	87.8	700	7.3	243	2.5	216	2.3	1	0.0	9535
Minnesota	3486	90.9	202	5.3	71	1.9	63	1.6	11	0.3	3833
Mississippi	4344	97.0	117	2.6	17	0.4	2	0.0	.	.	4480
Missouri	5845	95.7	195	3.2	54	0.9	15	0.2	.	.	6109
Montana	911	97.1	25	2.7	1	0.1	.	.	1	0.1	938
Nebraska	1526	96.5	42	2.7	7	0.4	5	0.3	1	0.1	1581

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
Nevada	1334	87.9	83	5.5	44	2.9	54	3.6	2	0.1	1517
New Hampshire	701	91.4	41	5.3	17	2.2	5	0.7	3	0.4	767
New Jersey	4073	87.0	251	5.4	146	3.1	209	4.5	5	0.1	4684
New Mexico	1669	86.2	195	10.1	45	2.3	26	1.3	1	0.1	1936
New York	8701	88.6	586	6.0	241	2.5	266	2.7	31	0.3	9825
North Carolina	7539	92.6	364	4.5	144	1.8	89	1.1	3	0.0	8139
North Dakota	427	89.1	20	4.2	16	3.3	14	2.9	2	0.4	479
Ohio	8285	92.9	457	5.1	129	1.4	44	0.5	7	0.1	8922
Oklahoma	3765	91.7	196	4.8	89	2.2	49	1.2	6	0.1	4105
Oregon	2604	91.1	148	5.2	58	2.0	46	1.6	1	0.0	2857
Pennsylvania	8624	93.9	391	4.3	95	1.0	41	0.4	30	0.3	9181
Puerto Rico	8,100.0	.	.	.	.	.	.	.	.	8	
Rhode Island	443	96.3	15	3.3	1	0.2	.	.	1	0.2	460
South Carolina	4708	95.7	169	3.4	33	0.7	4	0.1	3	0.1	4917
South Dakota	746	92.3	49	6.1	9	1.1	1	0.1	3	0.4	808
Tennessee	6878	97.0	154	2.2	44	0.6	17	0.2	1	0.0	7094
Texas	18126	95.7	484	2.6	193	1.0	127	0.7	8	0.0	18938
Utah	1688	93.6	65	3.6	18	1.0	19	1.1	14	0.8	1804
Vermont	427	88.6	25	5.2	11	2.3	6	1.2	13	2.7	482
Virginia	5006	90.3	323	5.8	112	2.0	96	1.7	9	0.2	5546
Virgin Islands	1,100.0	.	.	.	.	.	.	.	.	1	
Washington	3502	92.1	191	5.0	56	1.5	52	1.4	2	0.1	3803
West Virginia	1961	94.4	102	4.9	9	0.4	4	0.2	1	0.0	2077
Wisconsin	4070	90.7	208	4.6	130	2.9	74	1.6	4	0.1	4486
Wyoming	506	88.6	38	6.7	15	2.6	11	1.9	1	0.2	571
Military	15	83.3	.	.	.	.	.	.	3	16.7	18
Canada	117	65.4	1	0.6	2	1.1	.	.	59	33.0	179
Mexico	1	20.0	.	.	.	.	.	.	4	80.0	5
Other Country	5	14.7	.	.	.	.	.	.	29	85.3	34
TOTAL	220851	92.6	10965	4.6	3576	1.5	2647	1.1	508	0.2	238547

Table 2: Number of Suspensions or Revocations for Drivers with a SUSPENDED License in the Three Years Preceding their Fatal Crashes, by License State

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
Alabama	47	13.0	176	48.6	57	15.7	82	22.7	.	.	362
Alaska	2	25.0	4	50.0	1	12.5	1	12.5	.	.	8
Arizona	47	14.9	91	28.8	70	22.2	107	33.9	1	0.3	316
Arkansas	62	24.2	52	20.3	45	17.6	97	37.9	.	.	256
California	377	16.3	1178	50.9	446	19.3	312	13.5	.	.	2313
Colorado	17	11.3	78	52.0	29	19.3	26	17.3	.	.	150
Connecticut	10	10.4	35	36.5	23	24.0	28	29.2	.	.	96
Delaware	7	21.2	12	36.4	9	27.3	5	15.2	.	.	33
Dist of Columbia	1	14.3	4	57.1	1	14.3	1	14.3	.	.	7
Florida	148	13.4	358	32.4	219	19.8	376	34.1	3	0.3	1104
Georgia	73	13.6	254	47.3	105	19.6	105	19.6	.	.	537
Guam	.	.	.	.	.	.	1	100.0	.	.	1
Hawaii	23	50.0	12	26.1	7	15.2	4	8.7	.	.	46
Idaho	16	18.6	29	33.7	15	17.4	26	30.2	.	.	86
Illinois	140	31.5	189	42.5	67	15.1	48	10.8	1	0.2	445
Indiana	48	12.1	114	28.7	78	19.6	155	39.0	2	0.5	397
Iowa	9	11.0	34	41.5	15	18.3	24	29.3	.	.	82
Kansas	124	80.0	10	6.5	15	9.7	6	3.9	.	.	155
Kentucky	28	12.1	85	36.6	52	22.4	64	27.6	3	1.3	232
Louisiana	193	47.3	132	32.4	51	12.5	31	7.6	1	0.2	408
Maine	9	18.0	13	26.0	10	20.0	18	36.0	.	.	50
Maryland	17	30.4	17	30.4	13	23.2	8	14.3	1	1.8	56
Massachusetts	14	13.1	25	23.4	23	21.5	44	41.1	1	0.9	107
Michigan	13	3.2	130	31.7	93	22.7	174	42.4	.	.	410
Minnesota	8	13.6	19	32.2	13	22.0	19	32.2	.	.	59
Mississippi	13	12.9	63	62.4	17	16.8	6	5.9	2	2.0	101
Missouri	35	18.2	97	50.5	37	19.3	23	12.0	.	.	192
Montana	21	84.0	4	16.0	.	.	.	.	.	.	25
Nebraska	8	16.7	22	45.8	11	22.9	7	14.6	.	.	48

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
Nevada	8	11.6	13	18.8	6	8.7	41	59.4	1	1.4	69
New Hampshire	4	15.4	7	26.9	7	26.9	8	30.8	.	.	26
New Jersey	23	5.7	56	13.8	65	16.0	262	64.4	1	0.2	407
New Mexico	18	9.1	78	39.6	36	18.3	65	33.0	.	.	197
New York	59	13.3	113	25.4	77	17.3	194	43.6	2	0.4	445
North Carolina	36	12.6	81	28.4	52	18.2	116	40.7	.	.	285
North Dakota	4	13.8	7	24.1	5	17.2	13	44.8	.	.	29
Ohio	25	6.0	161	38.6	124	29.7	105	25.2	2	0.5	417
Oklahoma	54	25.8	70	33.5	38	18.2	47	22.5	.	.	209
Oregon	16	7.5	49	23.1	36	17.0	111	52.4	.	.	212
Pennsylvania	103	19.5	135	25.6	83	15.7	203	38.5	3	0.6	527
Rhode Island	17	53.1	11	34.4	3	9.4	1	3.1	.	.	32
South Carolina	48	16.6	170	58.8	58	20.1	13	4.5	.	.	289
South Dakota	4	10.5	23	60.5	6	15.8	5	13.2	.	.	38
Tennessee	160	46.0	117	33.6	41	11.8	30	8.6	.	.	348
Texas	73	12.1	247	41.0	121	20.1	162	26.9	.	.	603
Utah	12	21.8	21	38.2	11	20.0	9	16.4	2	3.6	55
Vermont	5	10.4	14	29.2	7	14.6	22	45.8	.	.	48
Virginia	47	17.6	77	28.8	47	17.6	96	36.0	.	.	267
Washington	18	7.0	100	38.9	50	19.5	89	34.6	.	.	257
West Virginia	23	28.8	43	53.8	5	6.3	9	11.3	.	.	80
Wisconsin	16	12.0	46	34.6	29	21.8	42	31.6	.	.	133
Wyoming	.	.	5	17.2	5	17.2	19	65.5	.	.	29
Military	.	.	.	.	.	.	1	100.0	.	.	1
Canada	.	.	.	.	.	.	1	33.3	2	66.7	3
Mexico	.	.	2	100.0	.	.	.	.	.	.	2
Other Country	.	.	2	50.0	1	25.0	.	.	1	25.0	4
TOTAL	2283	17.4	4885	37.3	2435	18.6	3462	26.4	29	0.2	13094

Table 3: Number of Suspensions or Revocations for Drivers with REVOKED Licenses in the Three Years Preceding their Fatal Crashes, by License State

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
Alabama	34	9.8	61	17.6	62	17.9	190	54.8	.	.	347
Alaska	11	39.3	8	28.6	2	7.1	7	25.0	.	.	28
Arizona	14	26.9	9	17.3	9	17.3	20	38.5	.	.	52
Arkansas	1	50.0	.	.	.	.	1	50.0	.	.	2
California	76	35.8	43	20.3	45	21.2	48	22.6	.	.	212
Colorado	32	22.2	40	27.8	25	17.4	47	32.6	.	.	144
Connecticut	.	.	1	33.3	.	.	1	33.3	1	33.3	3
Delaware	4	16.0	4	16.0	9	36.0	8	32.0	.	.	25
Dist of Columbia	2	40.0	2	40.0	.	.	1	20.0	.	.	5
Florida	10	27.8	15	41.7	6	16.7	5	13.9	.	.	36
Georgia	25	31.3	15	18.8	12	15.0	27	33.8	1	1.3	80
Guam	.	.	.	.	1	100.0	.	.	.	.	1
Hawaii	3	16.7	7	38.9	4	22.2	4	22.2	.	.	18
Idaho	1	33.3	2	66.7	.	.	.	.	.	.	3
Illinois	37	52.9	22	31.4	8	11.4	3	4.3	.	.	70
Iowa	6	8.5	29	40.8	11	15.5	25	35.2	.	.	71
Kansas	5	27.8	11	61.1	1	5.6	1	5.6	.	.	18
Kentucky	1	50.0	.	.	1	50.0	.	.	.	.	2
Louisiana	27	69.2	10	25.6	1	2.6	.	.	1	2.6	39
Maine	.	.	.	.	.	.	1	100.0	.	.	1
Maryland	34	31.8	34	31.8	24	22.4	14	13.1	1	0.9	107
Massachusetts	7	10.6	9	13.6	9	13.6	41	62.1	.	.	66
Michigan	8	15.7	13	25.5	8	15.7	22	43.1	.	.	51
Minnesota	16	19.0	29	34.5	12	14.3	26	31.0	1	1.2	84
Mississippi	2	50.0	1	25.0	1	25.0	.	.	.	.	4
Missouri	21	8.4	42	16.7	57	22.7	131	52.2	.	.	251
Montana	16	64.0	1	4.0	6	24.0	2	8.0	.	.	25
Nebraska	9	26.5	13	38.2	6	17.6	6	17.6	.	.	34
Nevada	10	22.7	9	20.5	9	20.5	16	36.4	.	.	44

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
New Hampshire	1	100.0	.	.	.	.	.	.	.	.	1
New Jersey	1	14.3	.	.	.	.	6	85.7	.	.	7
New Mexico	22	31.4	22	31.4	12	17.1	14	20.0	.	.	70
New York	28	17.6	19	11.9	30	18.9	82	51.6	.	.	159
North Carolina	79	14.9	120	22.6	116	21.9	215	40.6	.	.	530
North Dakota	2	28.6	.	.	2	28.6	3	42.9	.	.	7
Ohio	1	33.3	1	33.3	1	33.3	.	.	.	.	3
Oklahoma	36	28.1	43	33.6	22	17.2	27	21.1	.	.	128
Oregon	5	13.5	2	5.4	3	8.1	27	73.0	.	.	37
Pennsylvania	2	22.2	5	55.6	1	11.1	1	11.1	.	.	9
South Carolina	7	53.8	4	30.8	2	15.4	.	.	.	.	13
South Dakota	2	22.2	4	44.4	3	33.3	.	.	.	.	9
Tennessee	205	46.1	156	35.1	54	12.1	30	6.7	.	.	445
Texas	4	14.3	9	32.1	9	32.1	6	21.4	.	.	28
Utah	.	.	3	33.3	3	33.3	3	33.3	.	.	9
Vermont	.	.	1	16.7	2	33.3	3	50.0	.	.	6
Virginia	15	21.1	13	18.3	9	12.7	34	47.9	.	.	71
Washington	9	7.8	20	17.2	29	25.0	58	50.0	.	.	116
West Virginia	9	18.4	28	57.1	11	22.4	1	2.0	.	.	49
Wisconsin	12	6.2	32	16.4	35	17.9	116	59.5	.	.	195
Wyoming	.	.	1	25.0	.	.	3	75.0	.	.	4
TOTAL	852	22.9	913	24.5	673	18.1	1276	34.3	5	0.1	3719

Table 4: Number of Suspensions or Revocations for Drivers with EXPIRED Licenses in the Three Years Preceding their Fatal Crashes, by License State

	PREVIOUS SUSPENSIONS OR REVOCATIONS										Total
	None		1		2		3+		Unknown		
LICENSE STATE	N	%	N	%	N	%	N	%	N	%	N
Alabama	31	88.6	1	2.9	1	2.9	2	5.7	.	.	35
Alaska	7	100.0	.	.	.	.	.	.	.	.	7
Arizona	86	85.1	4	4.0	4	4.0	7	6.9	.	.	101
Arkansas	56	86.2	5	7.7	2	3.1	2	3.1	.	.	65
California	684	93.4	41	5.6	5	0.7	2	0.3	.	.	732
Colorado	50	92.6	2	3.7	.	.	2	3.7	.	.	54
Connecticut	7	87.5	1	12.5	.	.	.	.	.	.	8
Delaware	2	100.0	.	.	.	.	.	.	.	.	2
Dist of Columbia	2	100.0	.	.	.	.	.	.	.	.	2
Florida	12	85.7	1	7.1	.	.	.	.	1	7.1	14
Georgia	72	87.8	6	7.3	2	2.4	2	2.4	.	.	82
Hawaii	39	95.1	1	2.4	1	2.4	.	.	.	.	41
Idaho	22	71.0	1	3.2	3	9.7	4	12.9	1	3.2	31
Illinois	61	84.7	10	13.9	1	1.4	.	.	.	.	72
Indiana	72	85.7	3	3.6	5	6.0	4	4.8	.	.	84
Iowa	36	78.3	9	19.6	1	2.2	.	.	.	.	46
Kansas	45	100.0	.	.	.	.	.	.	.	.	45
Kentucky	49	98.0	.	.	.	.	.	.	1	2.0	50
Louisiana	96	91.4	9	8.6	.	.	.	.	.	.	105
Maine	1	100.0	.	.	.	.	.	.	.	.	1
Maryland	2	66.7	.	.	.	.	.	.	1	33.3	3
Massachusetts	22	71.0	4	12.9	3	9.7	2	6.5	.	.	31
Michigan	124	41.1	64	21.2	32	10.6	82	27.2	.	.	302
Mississippi	41	64.1	4	6.3	1	1.6	.	.	18	28.1	64
Missouri	88	90.7	6	6.2	2	2.1	1	1.0	.	.	97
Montana	26	92.9	1	3.6	1	3.6	.	.	.	.	28
Nebraska	19	90.5	1	4.8	1	4.8	.	.	.	.	21
Nevada	17	100.0	.	.	.	.	.	.	.	.	17
New Hampshire	5	62.5	1	12.5	1	12.5	1	12.5	.	.	8
New Jersey	6	66.7	.	.	1	11.1	2	22.2	.	.	9

	PREVIOUS SUSPENSIONS OR REVOCATIONS										TOTAL
	NONE		1		2		3+		UNKNOWN		
	N	%	N	%	N	%	N	%	N	%	N
LICENSE STATE											
New Mexico	19	82.6	2	8.7	1	4.3	1	4.3	.	.	23
New York	40	74.1	4	7.4	3	5.6	7	13.0	.	.	54
North Carolina	82	81.2	8	7.9	5	5.0	5	5.0	1	1.0	101
North Dakota	4	80.0	.	.	.	.	1	20.0	.	.	5
Ohio	168	65.6	45	17.6	16	6.3	24	9.4	3	1.2	256
Oklahoma	15	78.9	2	10.5	2	10.5	.	.	.	.	19
Oregon	21	75.0	2	7.1	2	7.1	3	10.7	.	.	28
Pennsylvania	39	95.1	1	2.4	1	2.4	.	.	.	.	41
Rhode Island	3	100.0	.	.	.	.	.	.	.	.	3
South Carolina	3	75.0	1	25.0	.	.	.	.	.	.	4
South Dakota	20	95.2	1	4.8	.	.	.	.	.	.	21
Tennessee	35	97.2	1	2.8	.	.	.	.	.	.	36
Texas	425	89.7	27	5.7	8	1.7	14	3.0	.	.	474
Utah	1	50.0	.	.	.	.	.	.	1	50.0	2
Vermont	3	100.0	.	.	.	.	.	.	.	.	3
Virginia	4	80.0	1	20.0	.	.	.	.	.	.	5
Washington	43	81.1	4	7.5	3	5.7	3	5.7	.	.	53
West Virginia	24	92.3	1	3.8	1	3.8	.	.	.	.	26
Wisconsin	28	93.3	2	6.7	.	.	.	.	.	.	30
Wyoming	4	100.0	.	.	.	.	.	.	.	.	4
Canada	1	100.0	.	.	.	.	.	.	.	.	1
Mexico	1	50.0	.	.	.	.	.	.	1	50.0	2
TOTAL	2763	82.5	277	8.3	109	3.3	171	5.1	28	0.8	3348

Appendix E: Explanation of Relative Likelihood (RL) Values

In Table 11 relative likelihoods (RLs) are provided to compare the characteristics and experiences of various aberrant license categories (e.g., suspended, revoked, expired, unlicensed, and unknown license status) to valid license holders. To keep the arithmetic simple, imagine that 500 valid license holders are involved in fatal crashes—300 are 40 years of age or older and 200 are less than 40 years of age. Further imagine that of 150 drivers operating on suspended licenses, 50 are 40 years of age or older and 100 are less that 40 years of age. In tabular form these data are displayed as follows:

Driver Age	Valid Licenses	Suspended Licenses	Total
<40 years of age	200	100	300
40+ years of age	300	50	350
Total	500	150	650

Clearly, 40 percent of the valid license holders are less than 40 years of age and 66.7 percent of the suspended drivers are less than 40 years of age. Therefore, if a suspended driver is chosen at random, he or she is 1.67 (66.7/40) times more likely to be under 40 years of age than a valid license holder chosen at random.

Slightly more formally, the estimated relative likelihood (RL) of a suspended driver being under 40 years of age (p_1) versus a driver with a valid license being under 40 (p_2) is:

$$RL = \left(\frac{p_1}{p_2}\right) = \left(\frac{\frac{100}{150}}{\frac{200}{500}}\right) = 1.67$$

The sampling distribution for RL is highly asymmetric about 1. When RL equals 1, aberrant license holders and valid license holder are equally likely to manifest the same condition or characteristic (e.g., less than 40 years of age). Values of RL ranging from 0 to 1 represent conditions that are less likely for aberrant drivers than for valid license holders. Conversely, values of RL ranging from 1 to + ∞ represent conditions under which the aberrant drivers exceed the valid license holders.

— continued

Test of the Significance of Relative Likelihood

The sampling distribution for the natural logarithm (ln) of relative likelihood (RL) ranges from - ∞ to + ∞ with a center of gravity (i.e., a mean) at zero, assuming that the characteristics and experiences of the various aberrant license categories are equivalent to those of valid license holders. Furthermore, the sampling distribution based on log relative likelihood [ln(RL)] is asymptotically normal with a standard error that can be approximated as:

$$SE_{\ln(RL)} = \sqrt{\frac{1 - p_1}{n_1(p_1)} + \frac{1 - p_2}{n_2(p_2)}} = 0.0796$$

Where p_1 and p_2 are as previously defined, and n_1 and n_2 represent the numbers of suspended drivers and valid license holders involved in fatal crashes, respectively.

In the present example, the RL = 1.67. And, the natural logarithm (ln) of 1.67 is 0.5128. The significance of the log relative likelihood (0.5128) may be assessed by transforming the calculated ln (RL) into a z score:

$$z = \frac{\ln(RL)}{SE_{\ln(RL)}} = \frac{\ln(1.67)}{0.0796} = 6.42$$

Values of z lying beyond ± 1.96 are said to be statistically significant at “ = 0.05. In this example, the ln(RL) (i.e., 0.5128) is significantly above zero. Or, the RL (1.67) is significantly above 1.0.

Finally, it should be noted that just three of the values reported in Table 11 are not significantly different from one (1.0) at “ = 0.05. Because the estimates provided in Table 11 are based on large N’s (i.e., thousands of drivers in the different aberrant license categories and in the valid license category), the standard errors of estimate about the natural logarithms of the values depicted are quite small. With very small standard errors of estimate, even small departures of the ln(RL) from zero (or the RL from one) will be statistically significant.

For more detail on the significance of relative likelihoods, see, for example, Sahai and Khurshid (1996).