Final Report on

Identification of Problem Commercial Licensed Drivers

to
Indiana State Police
Motor Carrier Division
Indianapolis, Indiana

September 1997

by
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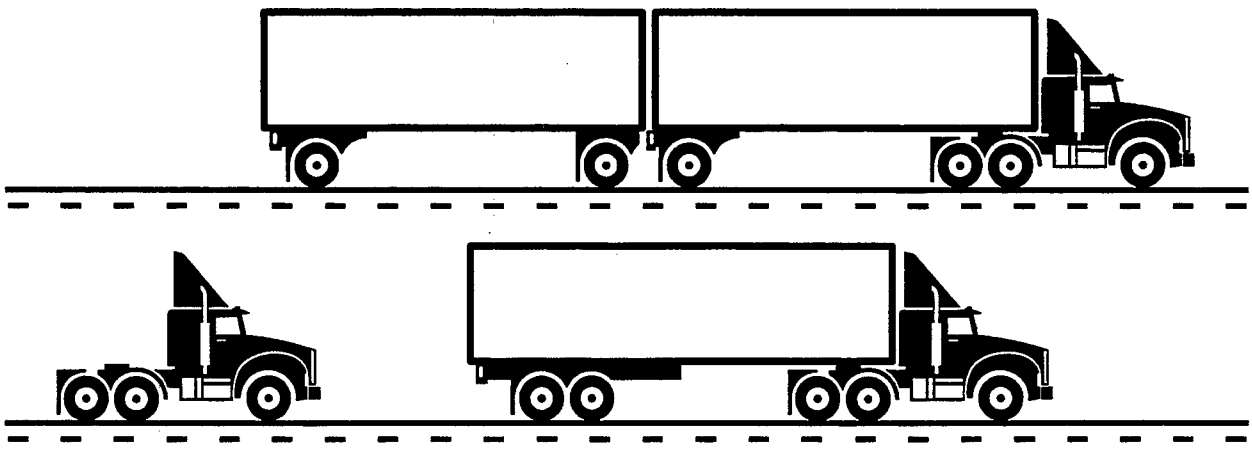

Executive Summary

IDENTIFICATION OF PROBLEM COMMERCIAL LICENSED DRIVERS

The objective of this program was the identification of commercial motor vehicle drivers who were overinvolved in truck crashes and provide a profile for those drivers. With that information, it was believed that measures could be taken to identify potentially dangerous drivers, retrain those drivers, or remove them from the roadway.

After examining the Indiana State Police Crash Databases for 1990 through 1994 and the Bureau of Motor Vehicle License Database (for Commercial Drivers only), the following criteria was used to determine a Study Group:

> *"drivers with a commercial drivers license involved in two or more crashes, one of which was in the larger truck category"*

This Study Group was composed of 3,731 drivers involved in 8,262 crashes. (Of the 8,262 crashes, only 150 were in commercially driven vans and pickup trucks.) A Control Group of 22,468 CDL drivers having 26,856 crashes (in trucks) was used for many comparisons.

The following factors were examined:

Driver Factors	Environment
Age	Time of Day
Drinking and Driving	Day of Week
Citations	Crash Location
Convictions	Weather Conditions
License Restrictions	Road Type
	Injuries and Fatalities

All of the above factors were compared for the Study Group and the Control Group. The study did provide a compilation of the major factors associated with truck crashes; but, it was not possible to derive a definitive driver or crash profile that could be used to identify potential problem drivers.

Further study of additional crash detail and driver characteristics and truck types, both within Indiana and the region, may provide additional insights into the attributes of a problem driver.

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SUMMARY

The Indiana State Police Crash Database and the Bureau of Motor Vehicle Drivers License records for Commercial Drivers Licenses were examined to determine if driver and crash characteristics could be used to develop a profile of problem commercial drivers. Driver characteristics (age, drinking, citations, convictions, and license restrictions) and crash details (time of day, day of week, location, weather, road type, and injuries and fatalities) were examined for both a Study Group of 3,371 drivers involved in 8,262 crashes and a Control Group of 22,468 drivers and 26,856 crashes.

The study did provide a compilation of the major factors associated with truck crashes; but, insufficient information was available to derive a definitive driver or crash profile that could be used to identify potential problem drivers.

OBJECTIVE

The objective of this program was the identification of commercial motor vehicle drivers who were overinvolved in truck crashes and provide a profile for those drivers. With that information, it was believed that measures could be taken to identify potentially dangerous drivers, retrain those drivers, or remove them from the roadway.

INTRODUCTION

In October 1995 the Indiana's Driver Examination Task Force (IDENT) initiated actions to undertake an agreement with the Automotive Traffic Center (ATC) at Purdue University to study the problem truck driver. Under that agreement, ATC was tasked to work closely with IDENT to accomplish the following:

- act as the Recorder for IDENT meetings. The transcribed minutes of each meeting would be provided to each Task Group member

- work with the IDENT and other sources to identify potential data that could be included in the development of an *at-risk* driver model. ATC would contact the appropriate agencies for data availability

- develop a detailed list of data variables that could be included in the driver model. ATC would obtain the appropriate data and/or databases that included the information deemed necessary for the model development

- develop and implement a sound research design which will allow meaningful analysis and interpretation of the data

- prepare a final report. This report would document the IDENT and ATC activities. Data coverage, collection/linkage procedures, research methodology, model development, and results of the study would be included with recommendations for future activities

This report summarizes the listed activities.

This activity was funded by a Grant from the Federal Highway Administration, Office of Motor Carriers, through the Indiana State Police, Motor Carrier Division.

TECHNICAL DISCUSSION

Two of the basic requirements needed to place a driver in the "high-risk" category were (1) the driver had an Indiana Commercial Drivers License (CDL) and (2) was operating a commercial vehicle, primarily – a truck, at the time of a crash.

The basic information required to define a study group resided in two databases:

- Indiana State Police (ISP) Crash Records. The study period was defined as 1 January 1990 through 31 December 1994. The five complete ISP databases for this period were obtained with the drivers' names, dates of birth, and crash details.

- Indiana Bureau of Motor Vehicles (BMV) Drivers License Database. Since our interests were limited to commercial drivers, information on 227,902 drivers holding Commercial Drivers Licenses (CDL) was extracted and provided for the study. (The database was obtained in August of 1996; a second run was made in February 1997 to correct problems encountered in reading some of the data.)

From these two databases, it was hoped that sufficient information could be extracted to define driver, vehicle, and crash factors that could be investigated to develop a profile for the driver and/or the crash factors in which he or she was involved. These included the following:

- driver profiles -- age, drinking and driving, traffic citations, convictions, and license restrictions
- vehicle involvement – primarily, trucks and semis
- crash factors – frequency, time and day of week, location, weather conditions, road type, and injuries and fatalities

Before examining all of these factors, it was first necessary to identify the study group. The procedures utilized to define this group, extract pertinent information, and analyze the data are presented in the following sections.

Driver Identification

The initial step taken to define a study group was to query the 5-year Crash Database to identify crash records for the following vehicle types (Parked vehicles were excluded from this study.):

-- Trucks (pick-ups and vans are not included in this category) (04)*
-- Semi-tractor without trailer (05)
-- Semi-tractor with one trailer (06)
-- Semi-tractor with multiple trailers (06A)

* Note: The numbers (04), (05), etc. are the database identification for vehicle type.

From this filtering, a list of drivers, by name and date of birth, was generated for everyone involved in a truck crash. By matching these drivers' records with the CDL Database, a group of commercially licensed drivers having at least one accident in the four truck and semi categories was defined as the Control Group, shown in Table 1. It was from this group that the Study Group was then selected.

Table 1. Control Group for Truck Crashes

Number of Crashes	Number of CDL Drivers in Control Group	Number of Crashes
1	18,853	18,853
2	2,982	5,964
3	524	1,572
4	84	336
5	19	95
6	6	36
Total	22,468	26,856

Since commercially driven pick-up trucks (02) and vans (03) are often operated by CDL holders, the number of the drivers in the Control Group involved in crashes in these commercially driven vehicles was also examined.

From this study, the following criteria was then used to define the Study Group (shown in Table 2):

> *"drivers with a commercial driver license involved in two or more crashes, one of which was in the larger truck category (04, 05, 06, 06A)"*

The records indicated that there were 78 pickups ("02" in the database) and 72 vans ("03") involved in crashes with CDL drivers. Applying this criterion to the drivers identified in the Control Group permitted the definition of the Study Group shown in Table 2. It should be noted that the Study Group Drivers are a subset of the Control Group Drivers, but the crashes in the Study Group contain the pickup and van crashes noted above.

Table 2. CDL Driver Study Group

Number of Crashes	Number of Drivers	Total Crashes
2	3,074	6,148
3	546	1,638
4	85	340
5	20	100
6	6	36
Totals	3,731	8,262

With the Control (22,468 CDL drivers) and Study (3,731 drivers) Groups established, the factors discussed in the following paragraphs were examined.

Driver Profiles

Age. In order to determine if age was a factor, both the Control Group and Study Group age distributions were examined. Since the numbers within each age span varied, the data were normalized on a crash rate basis. The crash rate was calculated as the "number of crashes per driver over the 5-year study period".

From the data shown in Table 3, age did not appear to be a significant factor in determining a high-risk group. In both the Study and Control Groups, the largest number of drivers were in the *25-34* age groups, but the crash rates were about the same over a wider age range. The drivers in the 25-44 age groups accounted for about 64 percent of all the crashes in both groups. These data were corroborated by information (presented in Appendix A) obtained from a major commercial trucking company.

Table 3. Crash Rates by Age Group

Age Group	Control Group			Study Group		
	Drivers	Crashes	Crash Rate	Drivers	Crashes	Crash Rate
Under 18	41	42	0.205	1	2	0.400
18 - 20	386	429	0.222	44	89	0.405
21 - 24	1,767	2,091	0.237	286	629	0.440
25 - 34	7,722	9,306	0.241	1,351	2,990	0.443
35 - 44	6,420	7,658	0.239	1,060	2,338	0.441
45 - 54	3,909	4,683	0.240	643	1,433	0.446
55 - 64	1,953	2,320	0.238	304	682	0.449
65 - 74	249	303	0.243	40	94	0.470
75 - 84	21	24	0.229	2	5	0.500
Total	22,468	26,856	0.239	3,731	8,262	0.442

Alcohol. Out of the Study Group, only 148 drivers (involved in 1.79% of that group's total crashes) were tested for blood alcohol content. The data presented in Table 4 are based on a driver and a related crash; therefore, it is possible that some of those shown as tested drivers were involved in more than one crash.

Table 4. Blood Alcohol Content (BAC) Test Results

BAC (percent)	Study Group (3,731) Drivers			Control Group (22,469) Drivers		
	Tested		Tested*	Tested		Tested*
	(Number)	(percent)	(percent)	(Number)	(percent)	(percent)
0	107	72.30	1.30	209	67.42	0.78
0.001 – 0.039	3	2.03	0.04	9	2.90	0.03
0.040 – 0.099	12	8.11	0.15	15	4.84	0.06
0.100 or more	14	9.46	0.17	53	17.10	0.20
Unknown	12	8.11	0.15	24	7.74	0.09
Totals	148		1.79	310		1.15

* Based on number of crashes – 8,262 for Study Group and 26,856 for Control.

When the two groups are compared, the results indicate the Study Group drivers had a higher rate of possible alcohol involvement (1.79 vs. 1.15 percent) based on total crashes. Only 26 drivers (17.6 percent of those tested) in the Study Group had a BAC greater than 0.040; the Control Group had 21.9 percent over the 0.040 level. The Study Group (with twice the crash rate as the Control Group, Table 3) had 0.32 percent alcohol related crashes; the Control Group had 0.26 percent alcohol related crashes. Although the differences are relatively small, it appears that the Study Group may have a slightly higher involvement with alcohol-related crashes.

Traffic Citations. The citations issued to drivers in the Control Group between 1 January 1990 and 31 December 1994 are shown in Table 5. Both the numbers of drivers receiving citations and the number of citations received by the drivers are shown. The citation rate for the entire group of 22,468 drivers is 0.162 citations per driver; for the 3,615 drivers having multiple crashes, the citation rate is 0.176. The Study Group Drivers with the highest crash rates did receive citations at an approximately 9 percent higher rate. 21 out of 633 drivers having 3 to 6 crashes had 120 citations – the rate being 0.190 citations per driver for the 3-6 crash group. It appears that the driver with 3 or 4 crashes will receive citations more frequently than the driver having only one crash.

Table 5. Drivers and Citation Count

Control Group		Citation	Crashes					
			1	2	3	4	5	6
Drivers	Citations	Count	Drivers					
21,437	0	0	17,976	2,849	505	82	19	6
296	296	1	257	35	4			
200	400	2	173	25	2			
160	480	3	135	22	3			
97	388	4	85	10	2			
89	445	5	76	12		1		
53	318	6	46	7				
37	259	7	32	4	1			
32	256	8	27	4	1			
22	198	9	14	5	3			
10	100	10	6	3	1			
4	44	11	3	1				
7	84	12	5	1	1			
9	117	13	6	1	1	1		
6	84	14	6					
2	30	15	2					
1	16	16		1				
2	34	17	1	1				
1	18	18	1					
1	19	19		1				
2	44	22	2					

Summary								
Control Group	Study Group		1 Crash	Multiple Crashes -- Study Group				
22,468	3,615	Drivers	18,853	2,982	524	84	19	6
3,630	636	Citations	2,994	516	102	18	0	0
0.162	0.176	Rates	0.159	0.173	(120/633 =) 0.190			

Conviction Offenses. Profiles of the conviction offenses were developed for the Study and Control Groups, as shown in Tables 6 and 7, respectively. These tables show all Indiana convictions in the CDL database attributed to drivers whether or not they were incurred while operating a commercial motor vehicle from 1 January 1990 through 31 December 1994. While many of these violations could contribute to a crash, there are also violations for other conditions or infractions.

The Study Group had 0.385 convictions per driver; the Control Group had 0.194 – about half of that for the Study Group. It should also be noted that the citation count, a total of 636 citations for 3,615 drivers in the Study Group (shown in Table 5), is only 45 percent of the conviction offenses. The Control Group citations, 3,630, are 83 percent of the convictions. [In studying DWI offenses for the state of Indiana, ATC has noted that some jurisdictions do not send all their citations to BMV. The same delays or omissions may be occurring here, also.] The difference between the citation/conviction ratios for the Study and Control Groups should be examined.

Speeding and *non-pointable violations* are the major conviction offenses for both the Study Group and the greater CDL population. These account for 81 – 82 percent of the offenses in both groups. After that, the percentages for the various offenses drop off quickly. One could conclude that speeding is a factor in these truck crashes, but, further examination of the data would be needed to find a correlation between the offenses and the crashes in either group. A study of all "moving violations" should also be undertaken.

The Crash Database showed 26 Study Group drivers had BAC greater than 0.040 when tested (Table 4) and 16 convictions related to alcohol noted in Table 6. For the Control Group, there were 68 drivers in the greater than 0.04 categories (Table 4) and 75 alcohol-related convictions shown in Table 7.

Table 6. Conviction Offenses for Study Group Drivers

Offense	Count	Percent
Speeding	606	43.41
Non-pointable violation	398	28.51
No insurance-ticket	59	4.23
Seat belt violation	52	3.72
Disregard traffic signal	32	2.29
Driving while suspended	22	1.58
Disregard traffic control device	18	1.29
No insurance – accident	16	1.15
Truck in restricted lane	14	1.00
Probable cause - failure	14	1.00
Following too closely	12	0.86
Reckless driving	10	0.72
Improper turn at intersection	10	0.72
Failure to signal	10	0.72
Disregard stop/yield sign	9	0.64
Disobedience of yield sign	8	0.57
No valid license	8	0.57
Wrong way on one-way road	7	0.57
Passing in no-passing zone	6	0.43
Operating while intoxicated	6	0.43
Operating per se	6	0.43
Unsafe start from park	6	0.43
Improper taillights	6	0.43
Improper headlights	4	0.29

Offense	Count	Percent
Child restraint violation	4	0.29
Unsafe lane movement	4	0.29
Inadequate brakes	4	0.29
Truck following too closely	4	0.25
Drive while susp/non-mem st	3	0.21
Improper MC passenger	3	0.21
Improper MC headgear	3	0.21
Disregard traffic officer	2	0.14
Driving wrong side of road	2	0.14
Fail to stop – train signal	2	0.14
Drive suspended – misd	2	0.14
Failure to yield ROW	2	0.14
Ignore RR X-ing stop sign	2	0.14
Improper passing	2	0.14
Improper parking	2	0.14
Improper use of center lane	2	0.14
Learner permit violation	2	0.14
Leave scene – vehicle accident	2	0.14
Never a valid license	2	0.14
OWI – unspecified	2	0.14
Prior OWI – within 5 yrs	2	0.14
Probable cause – refusal	2	0.14
Improper U-turn	2	0.14
Total	1,396	
Convictions per driver	0.385	

Table 7. Conviction Offenses for Control Group Drivers

Offense	Count	Percent
Speeding	1,920	43.89
Non-pointable violation	1,243	28.41
No insurance - ticket	194	4.43
Seat belt violation	190	4.34
Disregard traffic signal	79	1.81
Disregard traffic control device	68	1.55
Driving while suspended	62	1.42
Probable cause - failure	55	1.26
No valid license	42	0.96
Disregard stop/yield sign	37	0.85
Operating while intoxicated	37	0.85
No insurance - accident	33	0.75
Reckless driving	29	0.66
Improper turn at intersection	26	0.59
Unsafe start from park	23	0.53
Unsafe lane movement	22	0.50
Following too closely	22	0.50
Disobedience of yield sign	22	0.50
Truck in restricted lane	21	0.48
Operating per se	20	0.46
Failure to signal	18	0.41
Passing in no-passing zone	17	0.39
Improper parking	16	0.37
Failure to yield ROW	13	0.30
Truck following too closely	12	0.27
Improper taillights	12	0.27
Wrong way on one-way road	11	0.25
Child restraint violation	10	0.23
Inadequate brakes	7	0.16
Driving wrong side of road	7	0.16
Improper headlights	7	0.16
Fail to stop – train signal	6	0.14

Offense	Count	Percent
Driving left of center	6	0.14
Probable cause – refusal	6	0.14
Improper MC headgear	6	0.14
Drive suspended – misd	5	0.11
Drive while susp/non-mem st	5	0.11
Improper passing to right	5	0.11
Improper MC Lic Endorsement	5	0.11
No insurance - court	4	0.09
Prior OWI – within 5 yrs	4	0.09
Improper passing	4	0.09
Ignore RR X-ing stop sign	4	0.09
OWI - unspecified	4	0.09
Oper while intox/non-mem st	4	0.09
Never a valid license	3	0.07
Improper U-turn	3	0.07
Improper MC passenger	3	0.07
Learner permit violation	3	0.07
Improper use of center lane	3	0.07
Disregard traffic officer	2	0.05
MC learner permit violation	2	0.05
Leave scene – vehicle accident	2	0.05
Minimum speed/Improper lane	2	0.05
Failure to dim lights	1	0.02
Improper passing to left	1	0.02
Improper bumper height	1	0.02
Acc fail to give info/stop	1	0.02
Reckless driving – damage	1	0.02
Violation of DL restriction	1	0.02
Viol of financial resp restr	1	0.02
Temp MC learner permit viol	1	0.02
PDO accident – fail to stop	1	0.02
Total	4,375	
Convictions per driver	0.194	

License Restrictions. The CDL database was queried to determine the restrictions on the CDLs of the Study Group and the All CDL Drivers. These data are summarized in Table 8. The major restriction for both CDL driver groups was *Glasses or Contact Lenses*. The restrictions per driver for the Study Group and All CDL drivers were 0.374 and 0.376, respectively. There does not appear to be any obvious correlation between restrictions and crashes.

Table 8. Drivers License Restrictions

Restriction	Study Group	All CDL Drivers
Glasses or Contact Lenses	1,257	78,207
Outside Rearview Mirror	95	4,895
Conditional	40	2,389
BMV Restrictions	1	59
Photo Exempt	1	30
Daylight Driving Only	1	23
Automatic Transmission	0	20
Power Steering	0	7
Medical Waiver	0	6
Ignition Interlock Device	0	3
Employer's Vehicle Only	0	1
Motorcycle Only	0	1
Total Restrictions	1,395	85,641
Drivers	3,371	227,902
Restrictions/Driver	0.374	0.376

Crash Factors

Vehicle Involvement. Vehicle involvement by all drivers in the 5-year period is shown in Table 3. Of the 76,659 trucks and semis involved in crashes, 35 percent (26,856) were driven by Indiana CDL Control Group drivers. Inversely, this indicates that 65 percent of all truck and semi crashes involved an out-of-state or non-CDL driver.

Table 9. Vehicle Involvement for Control and Study Groups, 1990 - 1994

Database Identification	Vehicle Type	Crashes		
		All Licenses	Control Group	Study Group
02	Pickups	4,173		78
03	Vans	4,524		72
04	Trucks	40,182	12,744	3,562
05	Semi (Tractor Only)	2,373	1,179	382
06	Semi (Single trailer)	33,548	12,769	4,121
06A	Semi (Multiple trailers)	556	164	47
Sub Totals	Trucks and Semis	76,659	26,856	8,112
Totals		85,356	26,856	8,262

It should be noted that about 52 percent (40,182/76,659) of the *Trucks and Semis* could be operated by the out-of-state or non-CDL driver. This category can include rentals that may be driven by the "occasional" truck driver. A preliminary examination of truck ownership indicated that a large number of trucks involved in crashes were owned by leasing agencies.

In the Study Group, the majority of the crashes (4,121) involved semis pulling one trailer; the next highest category was the *Trucks*. In the Control Group, *Trucks* and *Semi (Single Trailer)* were equally involved in crashes.

The effects of environment, time of day and week, and location of the crashes were also examined to determine trends. These factors are summarized and discussed in the following sections.

Day of Week. Both the Study and Control Groups had similar crash distributions by the day of the week. The major number of crashes occurred during the normal workweek – Monday through Friday. In fact, the percentages and distribution for each day of the week for each group were almost identical. (Data given in Appendix A is almost equivalent. Those data indicate that *Monday* is the worst day for crashes.)

Table 10. Crashes by Day of Week

Weekday	Study Group		All CDL Drivers	
	Crashes	Percent	Crashes	Percent
Sunday	174	2.11	734	2.73
Monday	1,473	17.83	4,709	17.53
Tuesday	1,572	19.03	4,979	18.54
Wednesday	1,437	17.39	4,727	17.60
Thursday	1,496	18.11	4,877	18.16
Friday	1,634	19.78	5,142	19.15
Saturday	476	5.76	1,688	6.29
Totals	8,262	100.0	26,856	100.0

Time of day. The trends for the Study and the Control Groups (shown in Table 12) both indicate that the most crashes occur, as one might expect, during the working hours of 8:00 am to 5:00 pm. When time ranges are considered in 4-hour increments (Table 12) for the Study Group, the most truck crashes, 32.44 percent, occur during the 11:00 am to 3:00 pm period, with just about the same frequency, 32.40 percent, between 12:00 and 4:00 pm. If the Control Group crashes are considered, the crash pattern is about the same – 30.93 percent between 11:00 am and 3:00 pm, and 31.39 percent between 12:00 and 4:00 pm. (The data summarized in Appendix A indicate the same trend.)

Table 11. Time of Day (by Hour) Crash Profile

Time Period	Study Group		All CDL Drivers	
	Number	Percent	Number	Percent
0000 -- 0100	96	1.16	333	1.24
0100 -- 0200	86	1.04	290	1.08
0200 – 0300	79	0.96	266	0.99
0300 – 0400	74	0.90	263	0.98
0400 – 0500	122	1.48	377	1.40
0500 – 0600	165	2.00	471	1.75
0600 – 0700	271	3.28	880	3.28
0700 – 0800	494	5.98	1,447	5.39
0800 – 0900	587	7.10	1,926	7.17
0900 – 1000	480	5.81	1,676	6.24
1000 – 1100	639	7.73	2,128	7.92
1100 – 1200	625	7.56	1,933	7.20
1200 – 1300	702	8.50	2,218	8.26
1300 – 1400	652	7.89	1,968	7.33
1400 – 1500	702	8.50	2,196	8.18
1500 – 1600	622	7.53	2,056	7.66
1600 – 1700	580	7.02	1,856	6.91
1700 – 1800	347	4.20	1,129	4.20
1800 -- 1900	241	2.92	877	3.27
1900 -- 2000	141	1.71	556	2.07
2000 -- 2100	137	1.66	521	1.94
2100 -- 2200	126	1.53	420	1.56
2200 – 2300	119	1.44	441	1.64
2300 -- 0000	102	1.23	400	1.49
Unknown	73	0.88	228	0.85
Totals	8,262	100.0	26,856	100.0

Figure 12. Time of Day (by Periods) Crash Profile

Time Period	Study Group		Control Group	
	Number	Percent	Number	Percent
0600 – 1000	1,832	22.17	5929	22.06
0700 – 1100	2,200	26.62	7177	26.70
0800 – 1200	2,331	28.20	7663	28.51
0900 – 1300	2,446	29.60	7955	29.59
1000 – 1400	2,618	31.68	8247	30.68
1100 – 1500	2,681	32.44	8315	30.93
1200 – 1600	2,678	32.40	8438	31.39
1300 – 1700	2,556	30.93	8076	30.04
1400 – 1800	2,251	27.24	7237	26.92
1500 – 1900	1,790	21.66	5918	22.01

Locality. As shown in Table 13, approximately 44 percent of all crashes occurred in *Commercial/Industrial* areas. *Rural* and *Residential* areas accounted for another 47 to 48 percent of the crashes. Crashes in all other areas totaled less than 10 percent. This outcome is what one might expect; i.e., the Study Group may be working in the more densely populated and higher traffic areas. The Control Group may contain a relatively higher number of long-haul vehicles.

Table 13. Crash Locations

Locality	Study Group		Control Group	
	Number	Percent	Number	Percent
Commercial/Industrial	3,638	44.03	11,445	42.62
Rural	2,478	29.99	8,505	31.67
Residential	1,439	17.42	4,533	16.88
Urban Interstate	572	6.92	1,934	7.20
School/Playground	103	1.25	329	1.23
Public Park	16	0.19	59	0.22
Unknown	16	0.19	51	0.19
Totals	8,262	100.0	26,856	100.0

Road Type. The majority of all crashes – about 40 – 42 percent -- occurred on *City Streets* (Table 14); the fewest crashes occurred on the *Interstate*.

Table 14. Crashes by Road Type

Road Type	Study Group		Control Group	
	Number	Percent	Number	Percent
City Street	3,500	42.36	10,846	40.39
State Route	1,325	16.04	4,527	16.86
County Road	1,265	15.31	4,365	16.25
U.S. Route	1,227	14.85	3,965	14.76
Interstate	945	11.44	3,153	11.74
Totals	8,262	100.0	26,856	100.0

Weather Conditions. The weather condition for more than 53 percent of the crashes was considered *Clear*; another 27 percent of the crashes occurred in *Cloudy* weather (shown in Table 15). The remainder, approximately 20 percent, occurred during weather conditions that would be classified as "inclement". Hence, weather does not appear to be a major crash factor.

Table 15. Weather Conditions at Time of Crashes

Weather	Study Group		Control Group	
	Number	Percent	Number	Percent
Clear	4,382	53.04	14,323	53.33
Cloudy	2,267	27.44	7,323	27.27
Rain	980	11.86	3,119	11.61
Snow	423	5.12	1,373	5.11
Sleet/Hail/ Freezing Rain	102	1.23	336	1.25
Fog/Smoke/Smog	91	1.10	306	1.14
Unknown	17	0.21	76	0.28
Total	8,262	100.0	26,856	100.0

Injuries and Fatalities. Examining Injuries and Fatalities with respect to the Study Group, it appeared that a valid measure would be the "crash rates" for those factors. For the total crashes for the Study Group, the injury rate was 0.472 injuries per crash and 0.0153 for the fatalities. The drivers with the most crashes (3 or greater) had the lowest injury rates per crash; the drivers with the higher numbers of crashes (5 or 6) did not have any fatal crashes.

Table 16. Injuries and Fatalities for the Study Group

Crashes per Driver	Number of Drivers	Total Crashes	Injured		Fatalities	
			Number	Rate per Crash	Number	Rate per Crash
2	3,074	6,148	3,003	0.488	94	0.0153
3	546	1,638	634	0.387	26	0.0159
4	85	340	119	0.351	6	0.0176
5	20	100	33	0.330	0	0
6	6	36	8	0.222	0	0
Totals	3,371	8,262	3,897	0.472	126	0.0153

SUMMARY AND CONCLUSIONS

The results of this study are summarized in Table 17.

Table 17. Summary of Driver and Crash Characteristics

Factor	Study Group	Control Group
Crashes	8,262	26,856
Drivers	3,371 -- Crash rate = 0.442 80% greater than Control	22,468 – Crash rate = 0.239
Age	Majority between 25 – 44 Same as Control	Same
Alcohol -- Tested	148 drivers (1.79% of crashes)	310 drivers (1.38% of crashes)
-- BAC	26 (17.6%) had greater than 0.04	68 (21.9%) had greater than 0.04
Citations/Driver (Trucks/Semis only)	0.176 8.6% higher than Control	0.162
Convictions/Driver	0.385 Almost twice Control	0.194
License Restrictions	0.374 Same as Control	0.376 (All CDL Drivers)
Vehicles	Semi with 1 trailer	Truck or Semi with 1 trailer
Day of Week	Monday through Friday -- Friday is worst day	Same – except Monday is worst day
Time of day for most crashes	11:00 am to 4:00 pm	Same
Locality	Commercial/Industrial Area	Same
Road Type	City Street	Same
Weather Conditions	Clear	Same
Injuries	0.472 per crash	N/A
Fatalities	0.0153 per crash	N/A

Keeping in mind the definitions for the Study and the Control Groups, the following conclusions can be drawn from Table 17:

- the crash rate for the Study Group was 80 percent greater than the Control Group
- the drivers most likely to be involved in a crash were 25 to 44 years old
- a larger percentage of Study Group crashes had drivers tested for BAC – but, a larger percentage of tested Control drivers had greater than 0.04 BAC
- Study Group drivers received citations at a rate 8.6 percent higher than the Control
- Study Group drivers had almost twice the conviction rate as the Control
- based on percentages, the license restrictions were the same for both groups
- semis with 1 trailer were involved in most of the Study Group crashes; the Control had about an equal number of trucks and semis with one trailer involved
- although both groups had almost the same number of crashes during the Monday to Friday period, Friday was the worst day for crashes for the Study Group and Monday was the worst for the Control
- crashes occurred most frequently between 11:00 am and 4 pm, in commercial/industrial areas, on city streets, in clear weather
- Study Group crashes had a 47 out of 100 chance of an injury and 1.5 chance of a fatality

RECOMMENDATIONS

Although a definitive profile of the at-risk driver was not obtained, there are sufficient data to provide some guidance for further studies. It is recommended that this study be continued and expanded in several areas:

- additional coverage to include 1995 and 1996 Indiana Crash Data to get a (possibly) larger study group
- additional examination of the ISP crash and BMV driver records -- particularly, the relationships between drinking, crashes, citations, and convictions should be examined for each driver in the Study Group

- examine crash data to determine if additional details can be obtained to help define driver profile – e.g., long-haul vs. short-haul drivers, vehicular contributing circumstances, crashes with fatalities or injuries vs. property damage crashes, moving violations
- comparison with the general population crash data
- expansion of the coverage to include other states permitting introduction of driver histories in the region

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APPENDIX A

CRASH FACTORS REPORTED BY A MAJOR TRUCKING COMPANY

Table A-1. Crashes by Driver Age

Age Range	Number of Crashes	Percent of Total	Current Population Percent of Total
21 – 25	4	2.0	1.0
26 – 30	25	12.4	6.5
31 – 35	38	18.9	15.3
36 – 40	32	15.9	19.8
41 – 45	33	16.4	19.0
46 – 50	30	14.9	14.1
51 – 55	14	7.0	7.7
56 – 60	5	2.5	4.9
Over 60	8	4.0	1.9
Unknown	12	6.0	9.8

Table A-2. Crashes by Day of Week

Day of Week	Crashes	Percent
Sunday	1	0.5
Monday	46	22.9
Tuesday	43	21.4
Wednesday	33	16.4
Thursday	30	14.9
Friday	36	17.9
Saturday	12	6.0

Table A-3. Crashes by Time of Day

Time Range	Crashes	Percent
0001 – 0400	16	8.0
0401 – 0800	20	10.0
0801 – 1200	45	22.4
1201 – 1600	70	34.8
1601 – 2000	25	12.4
2001 – 2400	24	11.9
Unknown	1	0.5