Evaluation of Iowa's Driver Improvement Program

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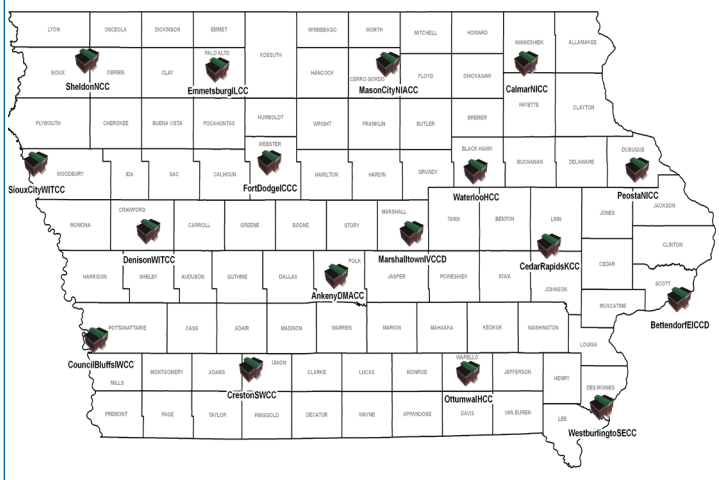
Center for Transportation Research and Education

Final Report
December 2009



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The preparation of this (report, document, etc.) was financed in part through funds provided by the Iowa Department of Transportation through its "Agreement for the Management of Research Conducted by Iowa State University for the Iowa Department of Transportation," and its amendments.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Iowa Department of Transportation.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
InTrans Project 08-329		

4. Title and Subtitle	5. Report Date
Evaluation of Iowa's Driver Improvement Program	December 2009
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Konstantina Gkritza, Wei Zhang, Zachary Hans, and Shashi Nambisan	

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Center for Transportation Research and Education Iowa State University 2711 South Loop Drive, Suite 4700 Ames, IA 50010-8664	11. Contract or Grant No.

12. Sponsoring Organization Name and Address	13. Type of Report and Period Covered
Iowa Department of Transportation 800 Lincoln Way Ames, IA 50010	Final Report
	14. Sponsoring Agency Code

15. Supplementary Notes

Visit www.intrans.iastate.edu for color PDF files of this and other research reports.

16. Abstract

This study examines the effectiveness of Iowa's Driver Improvement Program (DIP), measured as the reduction in the number of driver convictions subsequent to the DIP. The analysis involved a random sample of 9,055 drivers who had been instructed to attend DIP and corresponding data on driver convictions, crashes, and driver education training history that were provided by the Iowa Motor Vehicle Division. The sample was divided into two groups based on DIP outcome: satisfactory or unsatisfactory completion. Two evaluation periods were considered: one year after the DIP date (probation period) and the period from the 13th to 18th month after the DIP date.

The evaluation of Iowa's DIP showed that there is evidence of effectiveness in terms of reducing driver convictions subsequent to attending the DIP. Among the 6,790 (75%) drivers who completed the course satisfactorily, 73% of drivers had no actions and 93% were not involved in a crash during the probation period. Statistical tests confirmed these numbers. However, the positive effect of satisfactory completion of DIP on survival time (that is, the time until the first conviction) was not statistically significant 13 months after the DIP date. Econometric model estimation results showed that, regardless of the DIP outcome, the likelihood of conviction occurrence and frequency of subsequent convictions depends on other factors, such as age, driver history, and DIP location, and interaction effects among these factors.

Low-cost, early intervention measures are suggested to enhance the effectiveness of Iowa's DIP. These measures can include advisory and warning letters (customized based on the driver's age) sent within the first year after the DIP date and soon after the end of the probation period, as well as a closer examination of DIP instruction across the 17 community colleges that host the program. Given the large number of suspended drivers who continued to drive, consideration should also be given to measures to reduce driving while suspended offenses.

17. Key Words	18. Distribution Statement
conviction occurrence—DIP outcome—frequency of subsequent convictions—econometric analysis	No restrictions.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified.	Unclassified.	119	NA

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

EVALUATION OF IOWA'S DRIVER IMPROVEMENT PROGRAM

Final Report
December 2009

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The Midwest Transportation Consortium
provided funding for a graduate research assistant assigned to this project.

Sponsored by
the Iowa Department of Transportation.

Preparation of this report was financed in part
through funds provided by the Iowa Department of Transportation
through its research management agreement with the
Institute for Transportation,
InTrans Project 08-329.

A report from
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ACKNOWLEDGMENTS

The authors would like to thank the Iowa Department of Transportation for sponsoring this research and, in particular, Dr. Sandra Larson and Ms. Kim Snook for their efforts in initiating the project. The authors would also like to thank the Technical Advisory Committee members, including Kathy Ohorilko, Scott Falb, Toni Kerkove, Diane Sappenfield, and Dawn Hackleman, for their comments and insight throughout the project. Lastly, the authors would like to acknowledge the assistance of Inya Nlenanya, geographic information systems technician at the Institute for Transportation, with data integration and spatial visualization.

EXECUTIVE SUMMARY

Iowa's Driver Improvement Program (DIP) targets drivers who have been convicted of three or more countable moving violations (including out-of-state violations) committed within a 12-month period or drivers who have been convicted of a speeding violation of 25 to 29 miles over the posted speed limit. Under this program, those drivers may be required to attend driver improvement school and successfully complete, at the driver's own expense, a program approved by the Iowa Department of Transportation's (Iowa DOT's) Motor Vehicle Division in lieu of driver's license suspension. Currently, 17 community colleges across the state of Iowa offer the approved program. In total, 23,597 drivers were sent to DIP or volunteered to attend DIP from 2004 to 2007.

This study examined the effectiveness of Iowa's DIP, measured as the reduction in the number of driver convictions subsequent to attending the DIP. The analysis involved a random sample of 9,055 drivers who had been instructed to attend DIP. The sample was divided into two groups based on the DIP outcome (satisfactory or unsatisfactory completion). The "satisfactory" group consisted of the 6,790 (75%) drivers who successfully completed the DIP course. The "unsatisfactory" group consisted of the 2,265 (25%) drivers who did not complete or did not attend the DIP course after they received a letter to attend DIP. Interestingly, the distribution of men and women in each group was the same (64 % and 36%, respectively), which suggests that there was no difference between male and female drivers with respect to the DIP outcome. The drivers' actions were tracked four years before the DIP date, or the date when drivers were instructed to attend DIP. Action types were categorized into Iowa DOT actions/sanctions (suspended, disqualified, and revoked license) and driver actions (convictions and crashes). The probation period (one year after the DIP date) and the period from the 13th to 18th month after the DIP date were used to examine the effectiveness of the program in terms of reducing subsequent driver actions.

The evaluation of Iowa's DIP showed that there is evidence of effectiveness in terms of reducing convictions subsequent to attending the DIP. Among the 6,790 drivers in the "satisfactory" group, 73% had no actions and 93% were not involved in a crash during the probation period. The remaining 27% had on average 1.42 fewer convictions per driver than during the year prior to attending the program. During the period from 13 to 18 months after the DIP date, drivers who completed the DIP had much lower conviction and crash rates than they did prior to attending the program. Specifically, only 2% of DIP participants were involved in a crash during the period 13 to 18 months after attending the DIP. Due to the low variation in the subsequent number of crashes, the analysis focused on the effects of Iowa's DIP on subsequent conviction rates.

Turning to the type of violation, similar types of violations led drivers in both the "unsatisfactory" and "satisfactory" groups to attend the DIP, with speeding being the most common reason. During the probation period, speeding was still the major reason for a citation. After speeding, frequent reasons for receiving a citation after attending the DIP included no driver's license and driving while suspended. Therefore, addressing speeding violations or driving while suspended can be one of the principal objectives of the program.

Statistical methods were used to examine the effectiveness of Iowa's DIP. The statistical tests showed a statistically significant decrease in subsequent actions for the majority of DIP participants. In addition, probabilistic models were developed to examine the effect of factors such as age, gender, outcome, and location and interaction effects among these factors on the occurrence and frequency of subsequent convictions. It was found that drivers who did not attend or complete the DIP satisfactorily were more likely than drivers who completed DIP to have subsequent conviction(s) during the probation period. However, the DIP outcome was not a significant predictor of subsequent convictions during the period from the 13th to 18th month after attending DIP. This is consistent with the results of the survival analysis (that is, time until first conviction), which indicated that the positive effect of satisfactory completion of the DIP on survival time is not statistically significant 13 months after the DIP date. Some other notable factors identified in the statistical analysis included *age*, with younger drivers being at higher risk for a subsequent conviction (the hazard for older drivers is 90% lower than younger drivers); *driver history*, with low crash history for young drivers and low conviction history for female drivers leading to fewer subsequent convictions, while males with a high conviction history before DIP were at higher risk for subsequent convictions; and *DIP location*. The findings on the effect of location are likely influenced by differences in driver behavior in the presence of enforcement (or lack thereof) and in DIP instruction across different geographical areas in Iowa.

Recommendations to the Motor Vehicle Division regarding the effectiveness of the current program and the adoption of other measures for reducing the traffic conviction rate of high-risk drivers are summarized as follows:

DIP instruction: A closer examination of DIP instruction across the 17 community colleges could help explain spatial differences in DIP effectiveness.

Early intervention: The literature has shown that low-cost, early intervention measures (such as advisory and warning letters) within the first year after the DIP date and soon after the end of the probation period to advise/warn drivers before they become high-risk drivers and/or are involved in a crash can help reduce the safety risk. It is also recommended that the content of the letters be customized based on the driver's age. For example, standard letters that emphasize the threat of subsequent crashes or violations are more effective for male and female younger drivers, while soft-sell letters that put more emphasis on positive motivation, encouragement, and benefits are more effective for drivers older than 45 years old.

High-risk drivers: Consideration should be given to drivers with multiple convictions (in particular, for speeding) and younger drivers. It is suggested that they receive advisory letters soon after completing the DIP and after the probation period to remind them to drive safely and warning letters of future sanctions, such as license suspension, upon receiving subsequent convictions.

Driving while suspended: It was found that a large number of suspended drivers continued to drive. Consideration should be given to measures to reduce driving while suspended offenses. Vehicle control measures and California's impoundment program have been found to be

effective for reducing recidivism, in terms of subsequent convictions. However, the effectiveness of such measures and programs on crashes has been inconclusive.

1. INTRODUCTION

1.1 Problem Statement and Background Summary

In view of the public safety risk posed by drivers who violate the traffic rules and who are repeat crash offenders, several states have developed a number of programs/interventions for reducing that risk. Intervention strategies and programs vary between states but typically include warning letters, educational materials and courses, diagnostic reexaminations, individual counseling, and license suspension/revocation.

Iowa's Driver Improvement Program (DIP) targets drivers who have received multiple citations for moving violations. These drivers include those who have been convicted of three or more countable moving violations (including out-of-state violations) committed within a 12-month period or who have been convicted of a speeding violation of 25 to 29 miles over the posted speed limit. Under this program, those drivers may be required to attend driver improvement school and successfully complete, at the driver's own expense, a program approved by the Iowa Department of Transportation (Iowa DOT) in lieu of driver's license suspension. Currently, 17 community colleges across the state of Iowa offer the approved program.

Given the risk of traffic violations and crash repeaters as well as the substantial costs for state DIPs, a number of studies on the programs' effectiveness have been published in the past three decades. Most studies have been initiated by state motor vehicle divisions and offer state-specific results, while a few studies constitute a meta-analysis[1] and offer quantitative reviews of existing research. The evaluation period typically adopted in studies ranges from 6 to 24 months following the intervention. Meta-analyses, or comparative studies of driver improvement programs on crashes and violations, have concluded that driver improvement interventions generally result in a reduction of violations (Struckman-Johnson et al. 1989; Masten and Peck 2004). However, the crash effects were less pronounced and, in some cases, were mixed for different types of interventions. The types of driver improvement interventions (e.g., warning letters vs. group meetings), the orientation of driver improvement interventions (e.g., threatening vs. educational), or the type of participants (repeat offenders vs. first-time offenders) may also influence or moderate the effectiveness of driver improvement interventions.

While the aforementioned studies have certainly provided important insights in the effectiveness of DIPs (or select driver interventions), the effectiveness of driver educational materials and courses has not been fully evaluated. Furthermore, it is not likely that the results and their implications could be generalized beyond the state where the study was conducted, in view of the fact that driver population and driver-targeting interventions vary from state to state. Thus, there is a need for a study to evaluate the effectiveness of Iowa's DIP based on the resource/cost allocation and infrastructure it requires. There also is a need to investigate whether there are any spatial differences in the effectiveness of the various sites (i.e., community colleges) across the state that offer driver improvement courses.

[1] A meta-analysis combines the results of several studies that address a set of related research hypotheses.

The following section discusses the major research objectives to be accomplished and the anticipated benefits of this study.

1.2 Research Objectives and Benefits

The plan for this research project includes six tasks. They are listed below and accompanied by a discussion of the anticipated benefits.

Task 1: Selection of a Technical Advisory Committee for the Project

Technical Advisory Committee (TAC) members were identified in consultation with representatives from the Iowa Motor Vehicle Division (MVD) and the Iowa DOT Research and Technology Bureau. TAC meetings were scheduled as needed and in consultation with the project manager at the Iowa DOT.

Task 2: Synthesis of State of the Practice and Literature Review

The researchers provided an overview of the different DIPs offered across the nation and the findings of past studies regarding the effectiveness of those different programs.

Task 3: Data Collection

The researchers developed a database on driver citations, convictions, crashes, and driver education training history. First, the authors collected data on Iowa's DIP from 2004 to 2008 in terms of the locations where it was offered, the number of satisfactory and unsatisfactory completions, and volunteer attendances. The cost of implementing the DIP across Iowa was provided by the MVD. Last, the MVD provided data on driver citations and DIP outcome (satisfactory or unsatisfactory completion).

Task 4: Descriptive Data Analysis

The data collected under Task 3 were summarized and interpreted using descriptive analysis techniques and graphical representations.

Task 5: Cost-Effectiveness of Iowa's DIP

The effectiveness of the program was measured as the reduction in the number of violations and/or crashes drivers received after attending the DIP. The implementation costs of the program were also examined.

Task 6: Spatial Differences in Program's Effectiveness

The research team examined whether there are any spatial differences in the program's effectiveness across the places in Iowa where the DIP is offered. Statistical analyses and tests were used to compare the performance of drivers who attended the programs at various locations across the state. Evaluating such performance similarities or differences across the sites where the program is offered not only helps develop strategies to identify and improve the effectiveness of the program across individual sites but also assists the MVD in resource/cost allocation across the different program sites.

Task 7: Temporal Dimension of Program's Effectiveness

The research team examined whether the DIP has lasting effects in reducing conviction occurrence rates or whether the effects (if any) wane after the completion of the program. Survival analysis was applied to determine the period during which the effects of the driver improvement courses remain significant. Assessing this time frame could be beneficial if the MVD wishes to experiment with follow-up driver interventions to ensure a longer lasting effect.

Task 8: Conclusions and Recommendations

Based on the work conducted for the previous tasks, the research team made recommendations to the MVD regarding the effectiveness of the current program and the adoption of other driver education training mechanisms and materials for reducing the traffic conviction rate of high-risk drivers. Additional research needs were identified as well.

1.3 Report Organization

Table 1.1 lists the tasks for this project and the corresponding chapters.

Table 1.1. Tasks and corresponding chapters

Task	Corresponding Chapter
1. Selection of TAC	1. Introduction
2. Literature Review	2. Overview of DIPs 3. Effectiveness of DIPs
3. Data Collection 4. Descriptive Data Analysis	4. Data Collection and Descriptive Analysis
5. Cost-effectiveness of Iowa's DIP 6. Spatial Differences in Effectiveness 7. Temporal Dimension of Effectiveness	5. Statistical Data Analysis
6. Conclusions and Recommendations	6. Conclusions and Recommendations

2. OVERVIEW OF DRIVER IMPROVEMENT PROGRAMS

2.1 Overview of Iowa's Driver Improvement Program

The Iowa DOT, like other states, offers its own unique DIP (Iowa DOT 2007). It was established and fully implemented in 2001. Pertinent sections of the Iowa Code are provided in Appendix A, and the specifics of the program are summarized below.

2.1.1 Suspension of Driving Privileges

Driving privileges may be suspended in the following circumstances:

- *Habitual Violator*
  Drivers have been convicted of or pled guilty to three or more countable moving violations (including out-of-state violations) that were committed within a 12-month period.
- *Serious Violation*
  Drivers have been convicted of or pled guilty to speeding 25 miles or more over the legal speed limit.
- *Countable Moving Violations*
  This circumstance includes all moving violations, except the first two speed convictions within a 12-month period, that occur in speed zones between 34 and 56 mph and that involve drivers who were convicted of speeding 10 mph or less over the posted speed limit. A moving violation is defined to include all violations not specifically excluded by Iowa Code 321.210. (Examples of excluded violations include parking violations, failure to appear, equipment violations, registration violations, or disturbing the peace with a motor vehicle.)

2.1.2 Driver Improvement School

2.1.2.1 Drivers over 17 Years Old

When a driver's record shows convictions of three countable moving violations committed within a 12-month period or when the driver has been convicted of a speeding violation of 25 to 29 miles over the limit, drivers may be required to complete a driver improvement school at the drivers' local community college. After drivers have successfully completed the program, they will be on probation for one year. If drivers are convicted of a moving violation while on probation, the Iowa DOT's Office of Driver Services will start action to suspend their license. A suspension notice will also be mailed to drivers if they fail to complete the DIP.

2.1.2.2 Drivers under 17 Years Old—Graduated Driver Licenses

In Iowa, a Graduated Driver License (GDL) program has been implemented for drivers under the age of 17. The program issues three kinds of licenses: instruction permit, intermediate license, and full license. The law went into effect January 1, 1999, and has since been supplemented.

Instruction Permit

Eligibility requirements:

- This permit is available at age 14.
- Written consent of a parent/guardian is required. This consent may be given using one of two options: (1) the parent/guardian accompanies the teenager to the driver's license station to sign the consent form in the presence of the examiner or (2) the parent/guardian downloads the form "Parent's Written Consent to Issue Privilege to Drive or Affidavit to Obtain Duplicate License Form #430018" and signs the form in the presence of a notary public. The teenager may then present the completed and notarized form to the examiner, and the parent/guardian would not have to accompany the teenager to the driver's license station.
- The permit requires satisfactory performance in vision screening and knowledge tests.
- Proof of identity and verification of a Social Security number is required.

Conditions:

- The permit must be held for a minimum of six months.
- All driving must be supervised by a licensed driver. Drivers may drive only with a parent/guardian, an immediate family member over age 21, a driver education teacher, or a driver over 25 with written the permission of a parent/guardian.
- The number of passengers is limited to the number of safety belts available in vehicle.
- The driver must complete 20 hours of driving under adult supervision; a minimum of two hours must be between sunset and sunrise.
- The driver must drive accident-free and violation-free for the six consecutive months immediately preceding application for an intermediate license. The permit must not be expired or withdrawn during this six-month period.
- The driver must complete an Iowa-approved or comparable driver education course:
    - 30 hours of classroom instruction that must include four hours of substance abuse education, a minimum of 20 minutes on railroad crossing safety, and information on organ donation
    - A six-hour laboratory, three hours of which must be behind the wheel; may use simulators for the remaining time
    - No parental waiver of any behind-the-wheel drive time
- The instruction permit will have the words "under eighteen" printed on it.

Intermediate License

Eligibility requirements:

- This license is available at age 16.
- The driver must meet all the conditions of the instruction permit.
- The written consent of a parent/guardian is required. This consent may be given using one of two options: (1) the parent/guardian accompanies the teenager to the driver's license station to sign the consent form in the presence of the examiner or (2) the parent/guardian downloads the form "Parent's Written Consent to Issue Privilege to Drive or Affidavit to Obtain Duplicate License Form #430018" and signs the form in the presence of a notary public. The teenager may then present the completed and notarized form to the examiner, and the parent/guardian would not have to accompany the teenager to the driver's license station.

Conditions:

- This license must be held for a minimum of 12 months.
- The driver may drive in the following conditions:
    - Without supervision from 5:00 a.m. to 12:30 a.m.
    - Between 12:30 a.m. and 5:00 a.m. only with a licensed driver who is a parent/guardian, immediate family member over 21, or a designated adult over 25.
    - With a waiver between 12:30 a.m. and 5:00 a.m. to and from work or school-related extracurricular activities.
- The driver must complete 10 hours of driving under adult supervision; a minimum of two hours must be between sunset and sunrise. The supervision must be by a licensed driver who is a parent/guardian, immediate family member over 21, or designated adult over 25.
- The number of passengers is limited to the number of safety belts available in vehicle.
- The driver must drive accident-free and violation-free for the 12 consecutive months immediately preceding application for full license. The intermediate license must not be expired or withdrawn during this 12-month period.
- The intermediate license will have the words "under eighteen" printed on it.

Up to age 18, all conditions of the intermediate license shall remain in effect until the holder of the intermediate license has been issued a full license.

Full License

Eligibility requirements:

- This license is available at age 17.
- The driver must meet all conditions of the intermediate license.

- Written consent of a parent/guardian is required. This consent may be given using one of two options: (1) the parent/guardian accompanies the teenager to the driver's license station to sign the consent form in the presence of the examiner or (2) the parent/guardian downloads the form "Parent's Written Consent to Issue Privilege to Drive or Affidavit to Obtain Duplicate License Form #430018" and signs the form in the presence of a notary public. The teenager may then present the completed and notarized form to the examiner, and the parent/guardian would not have to accompany the teenager to the driver's license station.

Conditions:

- Full driving privileges are granted with no restrictions.
- For drivers under age 18 or age 21, the license shall have the words "under eighteen" or "under twenty-one," respectively, printed on it.

2.1.2.3 Remedial Driver Improvement

- This applies to drivers either holding an instruction permit or an intermediate license.
- The driver will be referred to the remedial driver improvement process if involved in one moving violation or if involved in an accident to which the driver contributed.
- Both the driver and a parent/guardian must participate in an interview with an Iowa DOT official.
- The Iowa DOT official may impose additional driving restrictions and/or recommend license suspension.
- From the date the traffic violation occurred—not the date of the conviction—or the date of the contributive accident, the license holder must begin a six-month (for instruction permit holders) or 12-month (for intermediate license holders) accident-free and violation-free driving period again to qualify for the next licensing level.

2.1.3 Driving while Suspended

Driving while a drivers' license is suspended is a misdemeanor. A conviction may result in a $1,500 fine and up to one year in jail if the driver is convicted of a serious misdemeanor. The length of suspension or revocation for some convictions may also be doubled if drivers are convicted of driving while their license is suspended. A work permit cannot be issued when drivers have been convicted of driving while their license was suspended. Drivers may also be barred from driving (under the provisions of Iowa Code Section 321.555) if they are convicted for driving while under suspension (Iowa Code Section 321.218 and 321A.32 Subsection 1).

2.1.4 Habitual Offender

Drivers will be barred for two to six years (Iowa Code Section 321.555 Paragraph 1) if they receive three or more of any combination of the following convictions in a six-year period:

- Manslaughter with a motor vehicle

- Conviction of operating while under the influence of alcohol or drugs (Iowa Code Chapter 321J)
- Conviction for driving while license is suspended, revoked, or barred; eluding or attempting to elude pursuing law enforcement vehicles; or serious injury by vehicle
- Failure to stop and leave information or render aid at the scene of an accident in which driver was involved, as required by Iowa Code 321.263

Conviction of six moving violations committed within a two-year period may cause drivers to be barred from driving for one year from the date of judgment (Iowa Code Section 321.555 Paragraph 2). Speeding convictions will count here if they are for 15 miles per hour or more over the speed limit.

Conviction for driving while barred, under either Paragraph 1 or 2 of the Iowa Code Section 321.555 as listed above, can result in a prison term.

2.1.5 Financial Responsibility

Any suspension as a result of moving convictions or any revocation for operating while intoxicated (OWI) and implied consent (Chapter 321J) requires compliance with Iowa's financial responsibility law. This requirement is normally met by filing proof of at least $55,000 insurance coverage. Otherwise, drivers must post security of $55,000 by certified check, cashier's check, money order, or surety bond. This filing must be maintained for two years.

2.1.6 Driver Improvement and Driving Record

The completion of a driver improvement course, probation period, or a suspension does not clear the driving record of any entries showing violations or accidents. The driving record will show all convictions, accidents, or suspensions during at least the previous five years. A license revocation for OWI will remain on the driver's record for 12 years.

2.1.7 Out-of-State Moving Traffic Violations

Convictions for moving traffic violations in other states count against the driver's record. The Iowa DOT determines the action to be taken concerning driving privileges.

2.1.8 Calculating Dates of Traffic Violations

The dates on which the offenses occurred, not the dates on which drivers are convicted of traffic violations, are considered when determining how many violations have taken place in a specified time period.

2.1.9 Driver Improvement and Commercial Driver's Licenses

Operators of commercial motor vehicles may be subject to additional penalties.

2.2 Driver Improvement Programs in Other States

2.2.1 Online Driver Education Courses

The online driver education course "I Drive Safely" has been approved in the following 15 states: Alaska, Arizona, Delaware, Florida, Kansas, Idaho, Maine, Missouri, Nevada, New Jersey, New Mexico, New York, North Dakota, Texas, and Virginia. Table 2.1 shows the online driver education courses that are offered across the nation.

Table 2.1. Online driver education courses across the nation

Type of Program/Course	State where the Program/Course is offered
Traffic school	Alabama, Arkansas, California, Connecticut, Florida, Maine, Missouri, Nevada, North Carolina, Virginia
Defensive school	Alaska, Arizona, Colorado, Delaware , Georgia, Hawaii, Illinois, Indiana, **Iowa**, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South California, Tennessee, Texas, Utah, Vermont, Washington, Washington D.C., West Virginia, Wisconsin, Wyoming
Court-referred courses when drivers get ticket	Arkansas, California (once every 18 months), Colorado, Connecticut, Florida (4, 8, or 12 hr long), Georgia, Hawaii, Illinois, Indiana, **Iowa**, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Hampshire, New York ,Oklahoma, Oregon, Pennsylvania, Rhode Island, South California, Tennessee, Utah, Vermont, Washington, D.C., West Virginia, Wisconsin, Wyoming, Missouri, Nevada, New Mexico, Texas, Virginia, Washington (4 or 8 hr long)
Court-permission courses when a driver gets a ticket	Arizona (also required to pay a fine), Kansas, Ohio
Court-ordered courses when a driver gets a ticket	Alabama, Alaska , North Carolina
Aggressive driver courses	Delaware

Table 2.1. Online driver education courses across the nation (continued)

Type of Program/Course	State where the Program/Course is offered
Point reduction	Alaska (2 points), Idaho, Maine (3 points), Nevada (3 points once every 12 months), New Jersey, New Mexico (when license is suspended), Virginia
Insurance discount	Arkansas, California (three-year renewal courses), Connecticut, Delaware (three-year refresher/renewal course), Georgia, Hawaii, Idaho (for drivers older than 55), Illinois, Indiana, **Iowa**, Kansas (three-year), Kentucky, Louisiana, Maine (for drivers older than 55), Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New Hampshire, New York, North Dakota (up to 5% for a two-year period), Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington DC, West Virginia, Wisconsin, Wyoming
	Mature Driver Improvement (MDI): California, Colorado, Florida, Maine, Maine, Nevada, New Jersey, New Mexico, North Dakota, Washington
Teen driver education courses	California, Colorado, Florida, Nevada, Oklahoma, Texas

Most states' online driver program is called "defensive school," while in 10 states it is called "traffic school." There is not much difference between these two kinds of programs.

In Alabama, Alaska, and North Carolina, drivers who have received a ticket need to receive permission from the court or judge to take a driving safety course. Drivers in other states are ordered or referred by the court to take the defensive course. The referred classes are not officially approved in those states. Taking this course may satisfy a court requirement or count towards an insurance discount. Drivers who take an online driver safety course, which most defensive schools offer, are eligible for an insurance discount. In Arizona, in addition to taking the defensive course ordered by a judge, drivers also pay a fine. Only one state, Delaware, offers the aggressive driver course. Drivers who have been cited as aggressive by the Delaware Division of Motor Vehicles need to attend an "Aggressive Driving Behavior Modification/Attitudinal Driving Program."

An online point reduction course (PRC) is offered in seven states, but different policies are in place. After taking a driver education course, drivers in Alaska and New Jersey can have two points erased from their record, while drivers in Maine and Nevada can have three points removed from their record. In New Mexico, drivers are required to take this course only when their license is suspended, while drivers in Idaho cannot take courses if their licenses have been suspended through the point system.

An insurance discount incentive is popular in 40 states. Some drivers earn this discount by taking an online driver safety course, while others earn this discount by completing a mature driver improvement (MDI) program. For example, PRC qualifies drivers who are 55 years of age or older for an insurance discount in Idaho and Maine. There is no limitation of age for the insurance discount in New Jersey; however, there is 5% discount for a three-year period if a driver's number of points is less than four. This course may only be completed once every 36 months in Idaho but can be completed every year in Nevada. In Delaware, drivers who have not taken a "Delaware Defensive Driving" course within the past 36 months can take a six-hour course and receive a three-point credit on their driver record, as well as a 10% discount on their auto insurance premium. Drivers who have taken a "Delaware Defensive Driving" course within the past 36 months can take a three-hour refresher course and receive a 15% credit on their auto insurance premium.

Finally, there are only six states who offer "Driver Education Courses" for teen drivers, as shown in Table 2.1.

2.2.2 Other Driver Improvement Programs

Besides online courses, states also have other programs that vary from state to state. In a meta-analysis of the driver improvement literature, Masten and Peck (2004) classified DIP interventions into eight categories: educational/info material, group meeting, individual meeting, letter, license suspension/revocation, license extension, point reduction, and probation.

An overview of these programs by state is presented in this section, while information on each program's effectiveness is provided in Chapter 3.

Arizona has established the "Traffic Violators School" (TVS) and "Traffic Survival School" (TSS). TVS aims to teach drivers how to survive under different types of traffic conditions, while TSS encourages more lawful driving behavior and targets mainly persistent violators. In California, "California's Traffic Violator School Citation Dismissal Policy" offers drivers the opportunity to complete a course and have their citations dismissed.

High school driver education is offered in North Dakota, Illinois, California, Colorado, Florida, Nevada, Oklahoma, and Texas. A graduated licensing system (GLS) was first offered in Florida, Michigan, and North Carolina and then became a nationwide policy in an effort to reduce the crashes experienced by teen drivers. GDL limits the age at which drivers may get the license permit, allows driving only under the safest conditions (for example, with an experienced, responsible adult driver in the vehicle), and places time restrictions on driving at night and on weekends.

Illinois, Maine, Pennsylvania, Virginia, and Oregon issue warning letters, which are argued to be a low-cost, early intervention measure to warn large numbers of drivers before they become high-risk drivers and/or are involved in a crash. In Oregon, there are four steps in the DIP:

advisory letters, warning letters, probation, and suspension. According to the classification by the letter content, warning letters can be divided into standard warning letters and soft-sell letters.

Home-study courses are offered in Connecticut, Florida, Minnesota, Nevada, New Mexico, Oklahoma, Texas, and Virginia. California provides one home-study course under the mature driver improvement program, which helps 55-year-old or older drivers enhance their driving skills and knowledge.

Table 2.2. Other driver improvement programs

State	Driver Improvement Program
Arizona	• Traffic Violators School (formerly Traffic Survival School)
California	• Vehicle control (impoundment/forfeiture) • Home-study courses for older drivers • Point system • Traffic Violator School Citation Dismissal Policy • Mature driver improvement • High school driver education
Connecticut	• Checkpoints program on parent-imposed driving limits • Home-study courses
Colorado	• High school driver education
Florida	• AARP Driver Safety Program • Graduated driver licensing • High school driver education • Home-study courses
Illinois	• A four-hour training course offered at Traffic Safety School • High school driver education • Warning letters
Maine	• Warning letters
Michigan	• Graduated driver licensing
Minnesota	• Home-study course
New Jersey	• License control (suspension/revocation)
New Mexico	• Home-study courses
Nevada	• High school driver education • Home-study course
North Carolina	• Graduated driver licensing
North Dakota	• High school driver education
Ohio	• Vehicle control (impoundment/forfeiture)
Oklahoma	• High school driver education • Home-study courses

Table 2.2. Other driver improvement programs (continued)

Oregon	• Advisory letters (standard and soft-sell) • Warning letters (standard and soft-sell) • License control (suspension/revocation) • Vehicle control (impoundment/forfeiture)
Pennsylvania	• Written re-examination • Warning letters
Texas	• High school driver education
Virginia	• Warning letters
Wisconsin	• Driver Improvement—Individual Counseling Program

2.3 Summary of Driver Improvement Programs

Iowa offers certain driving improvement programs, such as its driver improvement school; its policy of suspending driving privileges for habitual violators, serious violations, and countable moving violations; and its GDL program for drivers under 17 years old. The Iowa DOT can also consider adopting other driver education training mechanisms and materials, such as home-study courses (online courses), which have low costs but are not less effective than in-person programs; a mature driver improvement program, which is essential to refresh older drivers' skills and knowledge; and advisory or warning letters as a low-cost, early intervention measure to advise/warn drivers before they become high-risk drivers and/or are involved in a crash.

3. EFFECTIVENESS OF DRIVER IMPROVEMENT PROGRAMS

3.1 Overview

DIPs have been widely used in the United States, as well as internationally. The objective of the DIP is to reduce the number of traffic offense convictions and crashes in a driver's history and help drivers correct their potentially dangerous driving behavior. DIPs have been carried out in the United States for over 60 years, and there have been many evaluation studies of DIPs' effectiveness in reducing convictions and crashes. Meta-analyses or comparative studies of DIPs with regard to crashes and violations have concluded that driver improvement interventions generally result in a reduction in violations (Struckman-Johnson et al. 1989; Masten and Peck 2004). However, the crash effects were less pronounced (Ker et al. 2005) and, in some cases, mixed for different types of interventions. For example, Masten and Peck (2004) found that the distribution of educational or informational material was not associated with any crash reductions, in contrast to warning letters, group meetings, individual counseling, and license suspension/revocation. The types of driver improvement interventions (e.g., warning letters vs. group meetings), the orientation of driver improvement interventions (e.g., threatening vs. educational), or the type of participants (repeat offenders vs. first-time offenders) could potentially influence or moderate the effectiveness of driver improvement interventions. However, characteristics such as direct vs. indirect participant contact and group vs. individual contact were not found to be statistically significant factors for explaining the effectiveness of different DIPs (Struckman-Johnson et al. 1989).

This chapter provides the findings of a literature review on the effectiveness of different DIPs.

3.2 Review of Eight Types of DIP

As discussed in Section 2.2.2, there are eight interventions of DIPs in the United States: educational/info material, group meeting, individual meeting, letter, license suspension/revocation, license extension, point reduction, and probation.

3.2.1 Educational/Information Material

Educational/information material is effective to some extent when coupled with other driver control measures such as driver improvement letters, interviews, meetings, and probations. Epperson and Harano (1975) found that an informational pamphlet along with driver improvement letters can be effective in reducing the number of subsequent collisions and convictions of pre-negligent drivers. A written reexamination, which has been developed as one level of a multi-tiered driver improvement pilot program administered by the Pennsylvania Department of Transportation, was found to result in cost savings and in significant reductions in crash- and violation-involvement rates during a one-year evaluation period (Staplin 1993).

3.2.2 Group Meetings

A group meeting could include attending a traffic school; the eight-hour National Safety Council (NSC) Defensive Driving Course in Washington, DC; interviews (such as the Narrative Driving Group Interview); and specific meetings, such as the Group Educational Meeting, Speed Educational Meeting, Subject Interaction Meeting, and Driver Improvement Meeting.

The NSC is the premier provider of defensive driver training in the nation. In addition to the nationally recognized courses, NSC also offers state-certified programs through their Data Management Center to meet the needs of several states' regulations. Currently, each state has an NSC training center, but the regulations about insurance discounts and point reductions from the driver's record vary by state. Most defensive driving courses are offered online. Lund and Williams (1985) reviewed the literature on the effectiveness of this program, which included 124 controlled studies. Two-thirds of these studies showed a decrease in the frequency of traffic violations by about 10%. The remaining one-third of these studies did not support the finding that defensive driving courses resulted in a decrease in motor vehicle crashes. However, the authors found the results of these studies to be questionable and inadequate as assessments of defensive driving courses' effectiveness.

The four-hour training course offered at the Traffic Safety School in Cook County, Illinois, for drivers who have received their first traffic citation was evaluated for effectiveness in terms of reducing traffic violations. The study (Raub et al. 1999) concluded that the program was effective, but the effectiveness seemed to taper off 6 months after training for traffic citations and 90 days for traffic stops.

In Arizona, traffic violators could keep their driver licenses by taking the TSS and learning how to survive in the traffic environment. The TVS program was initiated in Arizona and targets persistent violators. McKnight and McKnight (1993) conducted an evaluation of traffic violation and traffic survival schools in Arizona over a two-year experimental period. The results showed that TVS resulted in a small but statistically significant decrease in crashes and violations over the 12 months immediately following the course assignment. However, there was no significant difference in violations during the second 12-month period. Because of the equal cost of administering the two programs, the authors questioned the statewide implementation of TVS due to the small differential benefit of the program.

3.2.3 Individual Meetings

Individual counseling is for drivers who are about to be reinstated after a suspension or revocation. The Wisconsin Driver Improvement—Individual Counseling Program is an educational treatment approach used for habitual violators (drivers who accumulate a certain number of demerit points in a given period of time or who are about to have their licenses reinstated following a revocation/suspension). Fuchs (1980) evaluated the effectiveness of an individual counseling program offered in Wisconsin and reported no beneficial effects.

3.2.4 Letters

Driver improvement letters are argued to be a low-cost, early intervention measure to warn large numbers of drivers before they become high-risk drivers and/or are involved in a crash.

Oregon's DIP originally consisted of four steps: advisory letters, warning letters, probation, and license suspension. Drivers with multiple convictions were sent an advisory letter to remind them to drive more safely, and then, upon receiving subsequent convictions, they were sent a warning letter about future sanctions, such as license suspension. Advisory letters could have different emphases; the content of standard letters emphasized the threat of subsequent accidents or violations, while soft-sell letters provided more emphasis on positive motivations, encouragement, and benefits (such as saving money on traffic fines and insurance rates).

Kaestner et al. (1965) compared three kinds of letters: a standard letter, a personalized version of the standard letter, and a personalized low-threat letter. The low-threat letter proved to be the most effective, although a personalized version of the standard letter also helped.

Jones (1997a; 1997b) evaluated the effectiveness of "high-threat" advisory letters and warning letters in Oregon and concluded that they are effective, but their effectiveness differs between men and women and among different age groups. Jones (1997a) also compared the effectiveness of two kinds of advisory letters in Oregon, a standard letter and a soft-sell letter, in terms of subsequent crashes, moving violations, and major violations during a 24-month period. With a Cox regression survival model, Jones (1997a) found that the recipients of advisory letters were involved in fewer traffic accidents and that the standard letter was more effective than the soft-sell letter. In addition, Jones (1997a) investigated the difference in effectiveness by age and by gender. It was found that standard letters were more effective for younger male and female drivers, while the soft-sell letters were more effective for drivers older than 45 years old. In a subsequent study, Jones (1997b) focused on the second level of the Oregon DIP: the warning letters. Using the same methodology (Cox regression survival model), Jones found soft-sell letters to be more effective than the standard warning letter. The difference in the effectiveness between the two types of letters is more pronounced for drivers over 25 years old than for younger drivers.

In 2002, the Oregon DIP changed from four steps (advisory letters, warning letters, probation, and suspension) to two steps (restriction and suspension). Strathman et al. (2007) evaluated the effectiveness of this change. The incidence of crashes and convictions were compared among DIP participants and random drivers during an 18-month period before suspension and an 18-month period after suspension. A regression-to-the-mean method and a multivariate analysis were undertaken to analyze the data. It was suggested to reinstate warning letters in Oregon because they were a cost-effective method for reducing safety risk.

In Virginia, Lynn (1983) evaluated the four most common DIPs that the state offered: (1) warning letters, (2) a one-time group interview, (3) the combination of a warning letter and the group interview, and (4) a personal interview followed by an eight-hour driver improvement clinic. The drivers were randomly assigned to treatment and non-treatment groups, and their

driving records were compared at the end of the year. It was found that the group interview was the most effective "treatment" in reducing the violations, while the warning letters were the least effective. None of the treatments were effective in reducing the subsequent accidents. The study recommended that the warning letter be modified or replaced by the group interview as the entry-level treatment.

3.2.5 License Control (Suspension/Revocation)

Drivers could have their driver's license suspended when they drive aggressively, have more than the allowed number of convictions within set timeframe, commit severe violations, have accumulated points, or have been charged with driving under the influence of alcohol. In some states (such as New Jersey and Oregon), drivers' privileges can also be suspended or revoked through a court order for failure to pay child support or for failure to maintain insurance. No state will issue a driver's license if the driver has an active suspension or revocation in another state.

Zimmerman and Fishman (2001) reported that around one-fourth of the drivers in New Jersey (220,427 out of a total of 867,065) had their driver's license suspended in 2000 because of failure to pay for the insurance charges. In addition, the authors claimed that a large number of suspensions could contribute to financial failures, and they recommended the following steps in order to remedy these problems: (1) provide for reasonable payment plans geared to income levels, (2) allow and authorize optional garnishment, and (3) permit individuals to drive legally during the payment period. Another report (Carnegie 2007) showed that there was no upward trend in the number of license suspensions in New Jersey and concluded from the study that license suspension in New Jersey was widely used as "punishment" or as a means to force drivers to appear in court or pay a fine.

A number of studies have concluded that license suspension and revocation are some of the most effective countermeasures for reducing the crash and traffic conviction rate of high-risk drivers. Jones (1987) found that Oregon's habitual traffic offender program was effective in reducing the risk of future major traffic convictions, non-major traffic violations, and crashes. Masten and Peck (2004) found that license suspension or revocation resulted in a 17% reduction in crashes and a 21% reduction in convictions. In an evaluation study of Oregon's DIP (Strathman et al. 2007), the authors concluded that the 11% decline in crashes and 13% reduction in Type A convictions they observed can be attributed to the effect of license suspension. However, since one of the objectives of license suspension/revocation is to eliminate driving for a given period, it is possible that much of the effect that is reported in the literature is attributed to reduced exposure and/or more careful driving during the suspension interval.

3.2.6 Vehicle Control

Vehicle control (impoundment/forfeiture) is an intervention targeted to drivers who continue to drive while their licenses are suspended or revoked or while they do not hold a license. It is the strictest countermeasure against risky driving. The use of impoundment and forfeiture was first implemented in Manitoba, Canada (Beirness et al. 1997), and in Portland, Oregon (Crosby 1995), respectively. Both studies found that vehicle control measures were effective in reducing

recidivism. However, Portland's forfeiture program did not affect the recidivism rate any more than if the vehicle had simply been impounded for a short period. In Ohio, vehicle impoundment and vehicle immobilization programs were implemented to target suspended/revoked and multiple driving under the influence (DUI) offenders. Evaluation studies (Voas et al. 1997; Voas et al. 1998) showed that these programs were effective in reducing the rates of subsequent DUI and driving while suspended offenses.

The impoundment and forfeiture laws in California came into effect in January 1995. Deyoung (1999; 2000) studied the general deterrent effect and specific deterrent effect associated with these laws. The first study showed that in the subsequent one-year evaluation period, drivers who had their vehicles impounded (because they continued driving while their license was suspended or revoked or who were unlicensed) had 23.8% fewer driving while suspended convictions, 18.1% fewer traffic convictions, and 24.7% fewer crashes than similar drivers whose vehicles were not impounded. The results also showed that repeat offenders were more influenced by vehicle impoundment sanctions. However, the later study in 2000, found no evidence that simply threatening to impound/forfeit the vehicles of suspended/ revoked drivers had a significant effect on those drivers' crash rates in California.

3.2.7 Point System

A point system is integrated into the driver improvement program of 35 states. Different offenses are assigned different points according to their degree of severity or potential hazard. Iowa is one of the eight states (which also include Illinois, Indiana, Massachusetts, Minnesota, Oregon, Washington, and Wyoming) that has a violation limit system. However, this special point system does not reflect the severity or hazard associated with moving violations (Strathman et al. 2007).

California's 8- or 12-hour Traffic Violator School with a Citation Dismissal can result in point reduction in the traffic violators' records. Courts in California may offer drivers who have been cited for traffic violations an opportunity to attend a TVS and have their citation dismissed. As such, no points will be added to the driving records of drivers who completed TVS courses and have court proof (Bloch 1997; Gebers 2007). Gebers (2007) examined the effectiveness of the California Traffic Violator School Citation Dismissal Policy using a quasi-experimental design, which was a methodological improvement from a prior evaluation study conducted in 1991. Two random groups of drivers were compared to one group receiving a TVS dismissal and to another group receiving a traffic conviction. Gebers (2007) found that the group of drivers who received the TVS citation dismissal experienced significantly more crashes than the convicted group in the subsequent one-year period, during which the difference in crashes increased from 4.83% to 10%. It was concluded from the results that the TVS citation dismissal policy had a negative impact on traffic safety, which suggested that the TVS citation dismissal probably caused an increase in crashes.

3.3 Other Specific Programs by State

In addition to the interventions in DIPs for general drivers, some specific programs are conducted for younger drivers and older drivers.

3.3.1 Graduated Driver Licensing

GDL programs were first implemented in Florida, Michigan, and North Carolina and then became a nationwide policy in a bid to reduce the number of crashes by limiting the age of drivers receiving license permits. There are three distinct stages: learner's permit, intermediate license, and full license stage, and restrictions vary by stage. In the first stage, teenagers are required to drive with an experienced, responsible adult driver in the vehicle**.** After six months when they step into the intermediate license stage, teenagers can have unsupervised driving during daytime, but they still need to have supervision when driving at night. Finally, there is no restriction at the full license stage.

Evaluation studies of the GDL in Florida (Ulmer et al. 1997), Michigan (Shope et al. 2001), and North Carolina (Foss et al. 2001) reported crash rate reductions of 9%, 25%, and 57%, respectively, for 16 year-olds. The behavioral impact of GDL on teenage driving risk and exposure was investigated by Karaca-Mandic (2008). It was found that GDL policies reduced accident rates and fatalities of 15- to 17-year-old novice drivers. In addition, more restrictive GDL policies and programs with nighttime restrictions could contribute greater reductions to teen driving prevalence during the night. However, exposing 15 to 17-year-old drivers to GDL cannot presume better drivers in the future.

In Connecticut, Simons-Morton et al. (2006) conducted the first statewide study on the effect of the checkpoints program on parent-imposed driving limits. Chi-squared and t-test analyses were applied, and the results showed that intervention from parents was higher at licensure, teens in the intervention group were significantly less likely to drive at night or at high speeds, and teens were less likely to commit a traffic violation than the comparison group in the subsequent 12-month period. However, the results showed that the program was not sufficient as a stand-alone approach to prevent violations and crashes.

3.3.2 Mature Driver Improvement Courses

MDI courses are offered to older drivers in an effort to update their driving skills and knowledge. In California, MDI courses include information on defensive driving, traffic laws, and the traffic safety impact of driver fatigue and health for drivers ages 55 and older.

In Florida, the AARP Driver Safety Program (DSP) is mainly addressed to older drivers (50 years old and over). The program aims to enhance their driving skills in today's increasingly challenging driving environment and help them adjust to common age-related changes, such as hearing, vision, and reaction time. McGwin and Owsley (2007) conducted two analyses in the state of Florida involving participants who took part in the AARP DSP in 2001 and 2002. One of the analyses compared violation and collision rates before and after the drivers attended a DSP program, and the other compared violation and collision rates between DSP participants and non-participants. Overall, it was found that, for DSP participants, there was a reduction in some types of collision and overall violation rates before and after attending the DSP program, but there was an increase in careless driving-related offenses and a higher rate of most common types of violations. The comparison between DSP participants and non-participants showed that, although

the differences in collision rates either diminished or became inverted after DSP participation (such that participants had lower rates compared to non-participants), DSP participants still had a higher crash rate compared to the rest of population. As such, the program's effectiveness is debatable.

3.3.3 Home-Study Courses

Berube (1995) compared home-study courses to in-person courses that were offered as part of California's MDI program. The author conducted three analyses: the first one compared the drivers who had completed the course at home (treatment group 1) to drivers who had not taken an MDI course (control group), the second analysis compared drivers who completed an MDI course in person (treatment group 2) to the control group, and the last one compared the home-study participants to the in-person participants (treatment group 1 versus treatment group 2). The results showed that the in-person MDI courses were not more effective than the home-study courses in reducing the subsequent overall fatal/injury crashes or total number of citations. Moreover, it was found that neither of the two types of course delivery was helpful to drivers without any recent citations. However, the courses were effective in reducing the number of subsequent citations of drivers with a citation history. No decrease in fatal or injury crash rates was reported.

Another study, conducted by the California Department of Motor Vehicles (Masten and Chapman 2003) for the legislature of the State of California, evaluated four different types of course delivery: classroom instruction, a home-study course using a CD-ROM, a workbook home-study course, and an Internet/workbook home-study course. Almost 1,500 students were randomly chosen to participate in the study. The participants were first asked to complete a knowledge and attitude exam and then indicate their preferences for course delivery. There was no difference in effectiveness, but students tended to prefer CD-ROM–based home-study courses and Internet/workbook home-study courses to the workbook or classroom courses. As such, a low-cost home-study course was recommended as the first step in the driver education program.

3.3.4 Driver Improvement Clinics Program

Similar to the point reduction courses, New Jersey, North Carolina, and Virginia offer the Driver Improvement Clinics (DIC) program, which can also help drivers remove points from their record. However, different rules apply in each state. For example, in North Carolina drivers can have three points removed if they accumulate seven points every five years, while in Virginia five points will be removed if a driver completes the DIC program. Henderson and Kole (1968) evaluated the effectiveness of the New Jersey DIC as a means of reducing accidents and violations. By constructing indices for crash and violation rates, the authors found that drivers who attended the DIC had lower crash and violation rates than the drivers in the control group over the same time period. It was concluded that the DIC was effective in reducing both violations and crashes. Waller and Padgett (1975) studied the profile of 951 DIC participants in North Carolina and unveiled significant differences in age, race, and sex and reported the annual miles driven between the DIC participants and the entire licensed population of North Carolina.

Unfortunately, no recent studies on the DIC program have been conducted to ensure that the program remains effective.

3.4 Summary of Literature

The literature review summarized eight basic types of DIPs and additional programs that are offered in some states. All DIP programs aim to reduce traffic offense convictions and crashes and to help drivers correct their potentially dangerous driving behavior. Several studies on DIP have been identified in the literature. In general, most programs were found effective in reducing drivers' violations at the beginning of the intervention. However, sustaining the program's effectiveness in the long-run in terms of reducing violations and helping reduce crash rates has not been fully established.

4. DATA COLLECTION AND DESCRIPTIVE ANALYSIS

4.1 Overview

This chapter will first present an overview of Iowa's DIP from 2004 to 2007 in terms of the locations where it is offered, satisfactory and unsatisfactory completions, and volunteer attendance. Next, the cost of implementing DIP across Iowa will be provided. Finally, data provided by the Iowa MVD on drivers who had been instructed to attend DIP will be summarized and interpreted using descriptive analysis techniques and graphical representations.

4.2 Driver Improvement Program Monthly Client Counts

Seventeen community colleges in different cities in Iowa offered DIPs from 2004 to 2007. Data on monthly client counts were provided by the Iowa MVD. The data included information on the community college, the city where it is located, the number of classes offered by each college, satisfactory and unsatisfactory completions, and volunteer attendance. In total, 23,597 drivers were sent to or volunteered to attend DIP during 2004–2007. Table 4.1 shows the sample data for the Northeast Iowa Community College (NICC) campus in Calmar City, Iowa, in January 2004. The community college names and abbreviations are listed in Table B.1 in Appendix B.

Table 4.1. Sample Iowa DIP data

January (2004)						
Community	**City**	**Class Number**	**Satisfactory Completions**	**Unsatisfactory (Typ. non-attendants)**	**Volunteers**	**Total***
NICC	Calmar	1	20	5	0	25

*Total = S (Satisfactory Completions) + U (Unsatisfactory Completions) + V (Volunteers)

Figure 4.1 shows the geographical distribution of the 17 community colleges in Iowa, which are well-dispersed across the state.

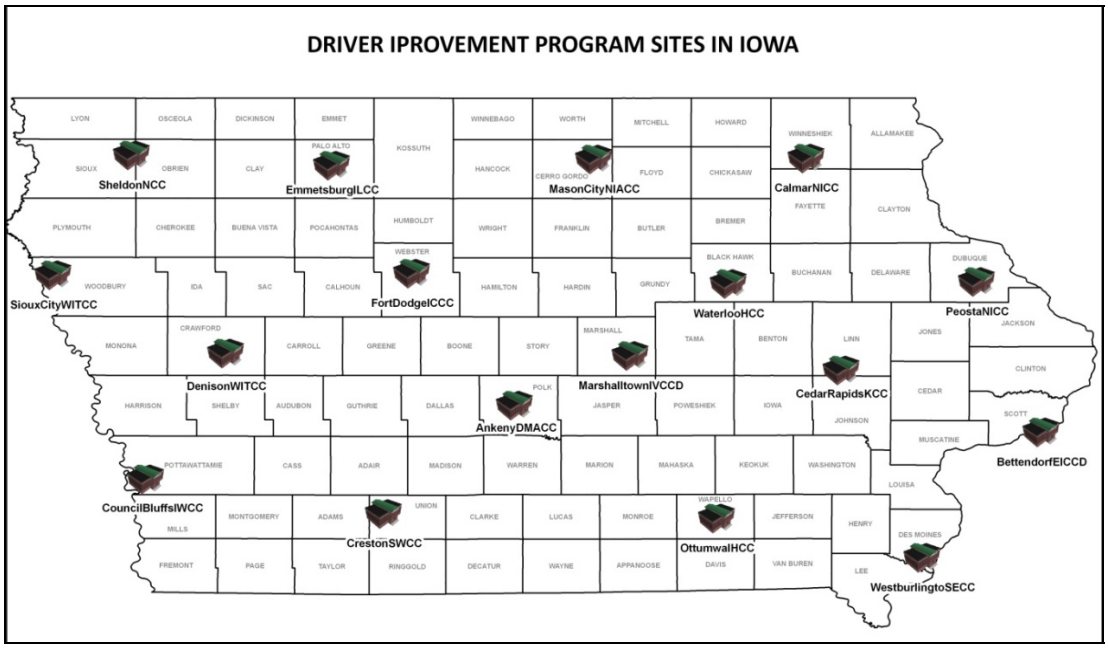

Figure 4.1. Location of 17 community colleges

Figure 4.2 shows the total number of classes that were offered by each community college from 2004 to 2007. Ankeny offered the highest number of classes from 2004 to 2007, an average of 57 classes per year.

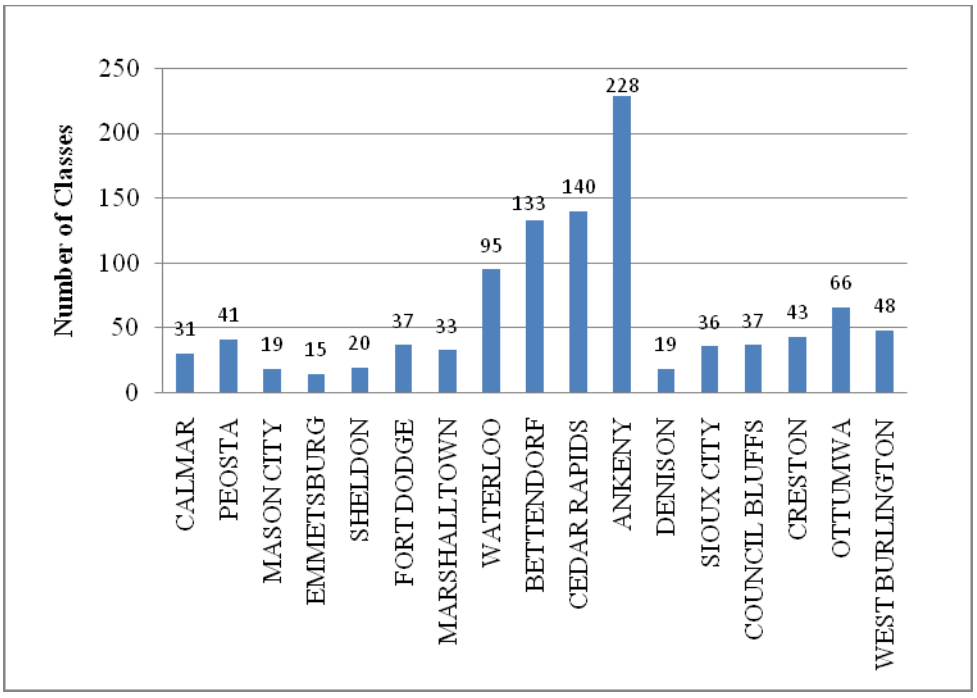

Figure 4.2. Total number of classes offered by each community college from 2004–2007

Figure 4.3 shows the average ratio of satisfactory completions to total completions and the average ratio of unsatisfactory completions to total completions from 2004 to 2007. These ratios measure the percentage of satisfactory and unsatisfactory completions in each community college. On average, Creston, Sheldon, and Peosta had the highest satisfactory to total completion ratios, while Sioux City and Council Bluffs had the highest unsatisfactory to total completion ratios. Table 2 presents the same information using a ranking system (1 being the college with the highest satisfactory completion ratio).

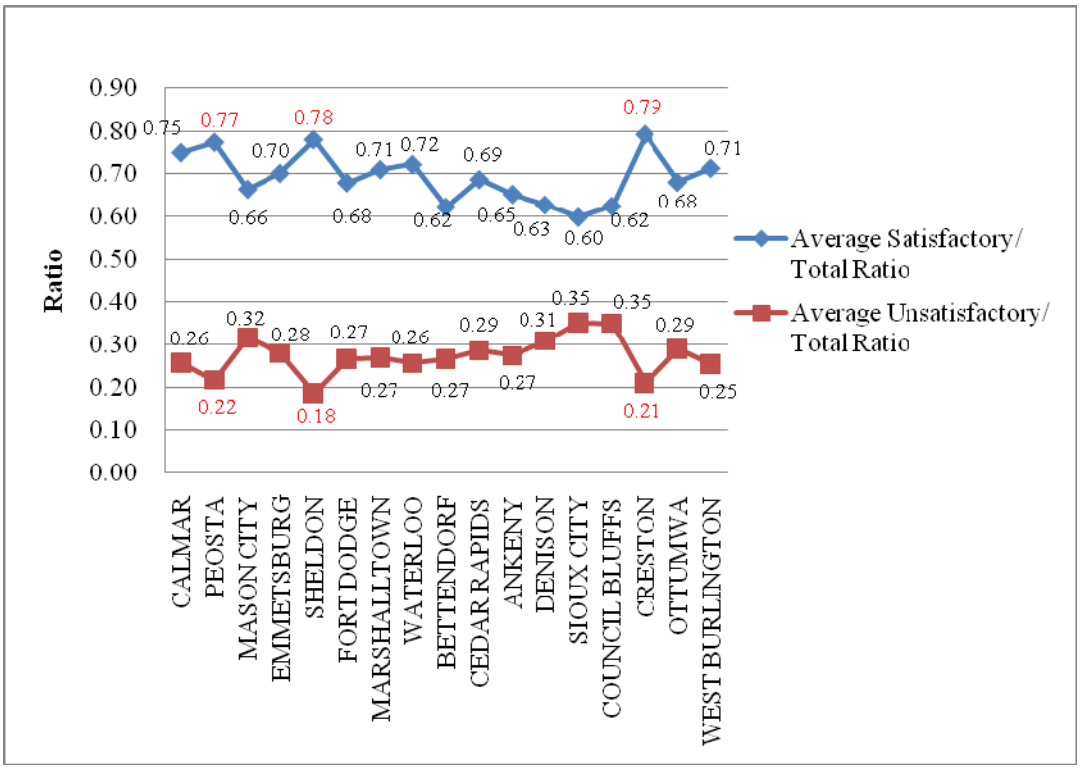

Figure 4.3. Average satisfactory and unsatisfactory completion ratios (2004–2007)

Table 4.2. Community college rankings based on satisfactory and unsatisfactory completion ratios

Ranking	Satisfactory/Total Ratio		Unsatisfactory/Total Ratio	
1	CRESTON	0.79	SHELDON	0.18
2	SHELDON	0.78	CRESTON	0.21
3	PEOSTA	0.77	PEOSTA	0.22
4	CALMAR	0.75	WEST BURLINGTON	0.25
5	WATERLOO	0.72	CALMAR	0.26
6	MARSHALLTOWN	0.71	WATERLOO	0.26
7	WEST BURLINGTON	0.71	FORT DODGE	0.27
8	EMMETSBURG	0.70	MARSHALLTOWN	0.27

Table 4.2. Community college rankings based on satisfactory and unsatisfactory completion ratios (continued)

Ranking	Satisfactory/Total Ratio		Unsatisfactory/Total Ratio	
9	CEDAR RAPIDS	0.69	BETTENDORF	0.27
10	FORT DODGE	0.68	ANKENY	0.27
11	OTTUMWA	0.68	EMMETSBURG	0.28
12	MASON CITY	0.66	CEDAR RAPIDS	0.29
13	ANKENY	0.65	OTTUMWA	0.29
14	DENISON	0.63	DENISON	0.31
15	BETTENDORF	0.62	MASON CITY	0.32
16	COUNCIL BLUFFS	0.62	SIOUX CITY	0.35
17	SIOUX CITY	0.60	COUNCIL BLUFFS	0.35
	Average	*0.69*	*Average*	*0.27*

Interestingly, when comparing the ratio of unsatisfactory completions to satisfactory completions (Figure 4.4), the authors found that the ratio for Sioux City was more than one in 2007, which suggests that most drivers who were instructed to attend that program did not attend, at least at that location. Moreover, Figure 4.4 shows that this ratio was higher in 2007 compared to the previous three years.

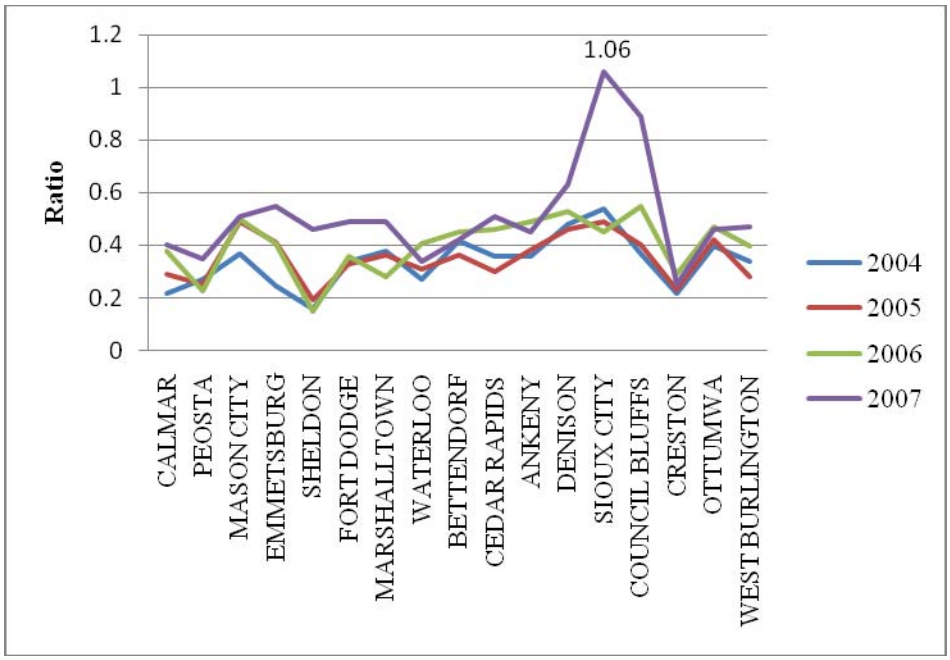

Figure 4.4. Ratio of unsatisfactory to satisfactory completions (2004–2007)

The authors brought these findings to the attention of the MVD staff and learned that the reporting system for DIP changed in 2007, and, as such, not all of the drivers who were instructed to attend DIP were included in the database.

4.3 Cost of Implementing the Driver Improvement Program

The MVD provided the research team information on the cost of Iowa's DIP. Drivers are required to pay $75 to attend Iowa's DIP. Different sponsor sites have different DIP facilitator fees, as shown in Table 4.3.

Table 4.3. Cost of implementing the program by community college

Number	Community	City	Cost ($)
1	NICC	CALMAR	27.00+$0.4 per mile
2	NICC	PEOSTA	27.00
3	NIACC	MASON CITY	32.98
4	ILCC	EMMETSBURG	26.00
5	NCC	SHELDON	27.00+$7.00 mileage and meal allowance
6	ICCC	FORT DODGE	25.00
7	IVCCD	MARSHALLTOWN	21.00
8	HCC	WATERLOO	25.00
9	EICCD	BETTENDORF	27.00
10	KCC	CEDAR RAPIDS	21.75
11	DMACC	ANKENY	28.25
12	WITCC	DENISON	27.00
13	WITCC	SIOUX CITY	27.00
14	IWCC	COUNCIL BLUFFS	27.00
15	SWCC	CRESTON	23.00
16	IHCC	OTTUMWA	31.25
17	SECC	WEST BURLINGTON	18.50

4.4 Data on Drivers Instructed to Attend DIP

A random sample of driving records for drivers who had been instructed to attend a DIP was provided by the Iowa MVD. The database includes driver-specific information, including gender, age, license class, date sent to DIP, location of DIP, and DIP outcome (satisfactory or unsatisfactory completion), as well as action-specific information, including the action type, reason code, driver PID number, actual speed, posted speed limit, jurisdiction, and crash case number.

Drivers were divided into two groups based on the DIP outcome (satisfactory or unsatisfactory completion). The "satisfactory" group consisted of drivers who successfully completed the driver improvement program course. The "unsatisfactory" group consisted of drivers who did not complete or did not attend DIP after they received a letter. The DIP date refers to the date when drivers were instructed to attend DIP. Actions types were categorized into Iowa DOT actions or sanctions (suspension, disqualified, and revoked license) and driver actions (convictions and crashes). It should be noted that the license of the drivers in the "unsatisfactory" group would be suspended; the license of the drivers in the "satisfactory" group would be suspended after the DIP date upon their first conviction within 12 months.

4.4.1 Descriptive Analysis

4.4.1.1 Driver-Specific Information

Figure 4.5 shows that most of the drivers in the sample were sent to DIP from 2006 to 2008. As such, the authors considered the driver-specific information that was provided for those years (a total of 12,354 drivers).

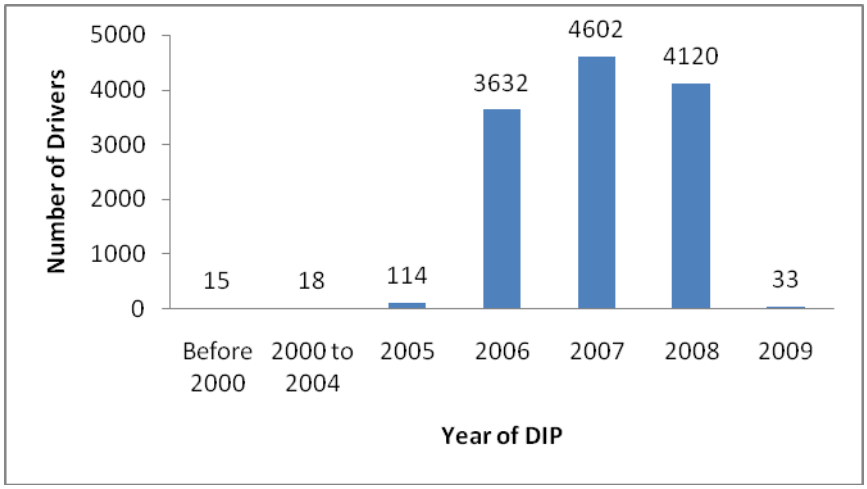

Figure 4.5. Number of drivers by year of DIP

The sample size was further reduced to 9,055 drivers by considering only the drivers who owned a Class C license and the drivers for whom there was complete information on gender, age, location of DIP, and DIP outcome. As such, the total number of DIP participants in the final sample was 2,746 (30%) in 2006, 3,373 (37%) in 2007, and 2,936 (33%) in 2008.

Figure 4.6 shows the distribution of drivers by year for the 17 community colleges that offer DIP. The Des Moines Area Community College (DMACC), Eastern Iowa Community College District (EICCD), and Kirkwood Community College (KCC) were the top three colleges in terms of DIP participation rates. The distribution of driver population by DIP date in the 17 community colleges is shown in Appendix C.

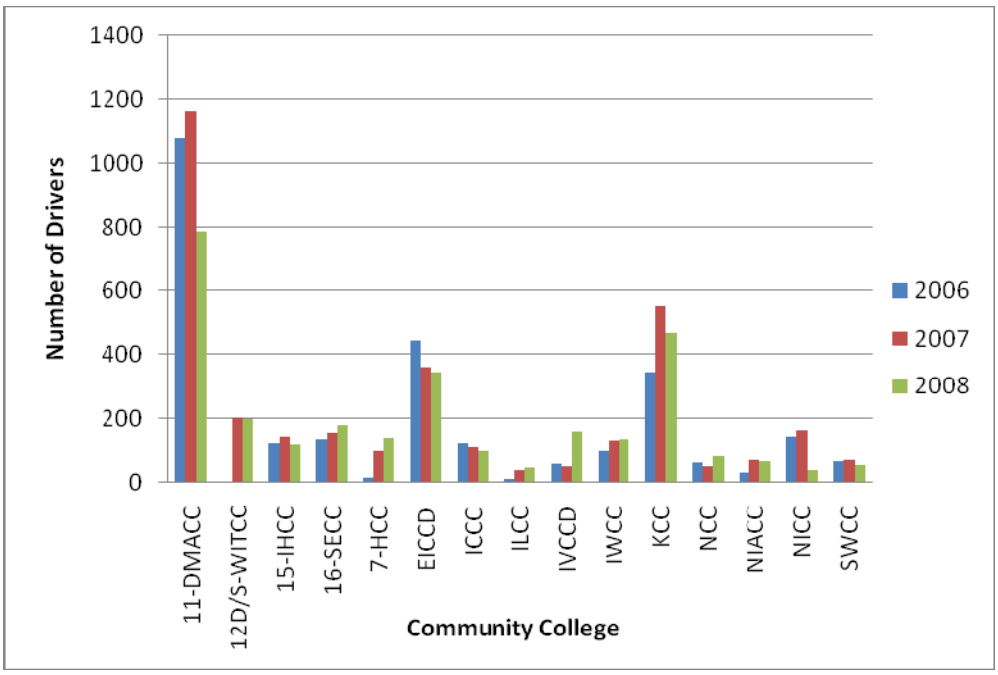

Figure 4.6. Number of drivers by DIP location (2006–2008)

4.4.1.2 Action-Specific Information

Actions types were categorized into Iowa DOT actions (suspension, disqualified, and revoked license) and driver actions (convictions and crashes). Table B.2 in Appendix B shows the different reasons for convictions; for example, reason code 12 refers to driving while holding a suspended, denied, cancelled, or revoked license. Drivers who were convicted for speed limit violations (reason code 72) exceeded the speed limit by an average of 13.7 miles per hour (standard deviation of 6.2 miles per hour).

Table 4.4 shows the distribution of all the actions before DIP by year. It can be seen that most actions can be tracked four years before the DIP date.

Table 4.4. Distribution of all the actions before DIP by year

Year	<0	**1**	**2**	**3**	**4**	5	>5
Number of Actions	1,303	**32,113**	**10,940**	**5,228**	**1,139**	250	982

Table 4.5 shows the distribution of all the actions after DIP by month group. It is of interest to examine the effectiveness of the program within the probation period (one year after the date the driver attended DIP), when Table 4.5 shows that most actions occur. The authors also examined the effectiveness of the program during the period from the 13th to 18th month after the DIP date, after which the number of actions seemed to drop significantly.

Table 4.5. Distribution of all the actions after DIP by month group

Month Group	<0	**0-12**	**13-18**	18-24	25-36	>37
Number of Actions	906	**9,761**	**1,598**	1,024	962	102

4.4.1.3 Summary Statistics

Table 4.6 shows the summary statistics for the driver- and action-specific variables in the final sample. The summary statistics for the interaction effects of driver attributes (age, gender, conviction, and crash history) and DIP-specific information (location and outcome) are presented in Table D.2 in Appendix D.

Table 4.6. Summary statistics of variables

Variables	**Mean or Percentage (standard deviation)**
Gender Male/Female	35.8/64.2
Community Colleges DMACC/EICCD/KCC/Other	33.5/12.7/15.1/38.7
Age 20 or younger/21-30/31-40/41-50/51 or older	32.4 (12.2) 6.5/51.0/19.6/13.3/9.6
Number of Convictions before DIP 1/3/4/5/Other	3.5 (1.6) 11.0/33.1/23.2/12.9/19.8
Number of Crashes before DIP 0/1/Other	0.4 (0.66) 69.3/24.4/6.3
DIP Outcome Satisfactory/Unsatisfactory	75.0/25.0
Number of Convictions within 12 months after DIP	0.3 (0.67)
Variables	**Mean or Percentage (standard deviation)**
Number of Crashes within 12 months after DIP	0.06 (0.26)
Number of Convictions from 13th to 18th month after DIP	0.08 (0.33)
Number of Crashes from 13th to 18th month after DIP	0.02 (0.13)
Number of Days after DIP until the first conviction	199.1 (142.6)
Number of Days after DIP until the first crash	213.6 (144.8)

4.4.2 Interaction Effects

4.4.2.1 Gender and DIP Outcome

As shown in Table 4.6, 6,790 (75%) drivers completed the course satisfactorily (S), while 2,265 (25%) drivers were included in the "unsatisfactory" group (U). Figure 4.7 shows the distribution of drivers by gender and DIP outcome. The percentages of female and male drivers are the same in both groups—36% and 64%, respectively. This suggests that there was no difference between male and female drivers with respect to DIP outcome (satisfactory or unsatisfactory).

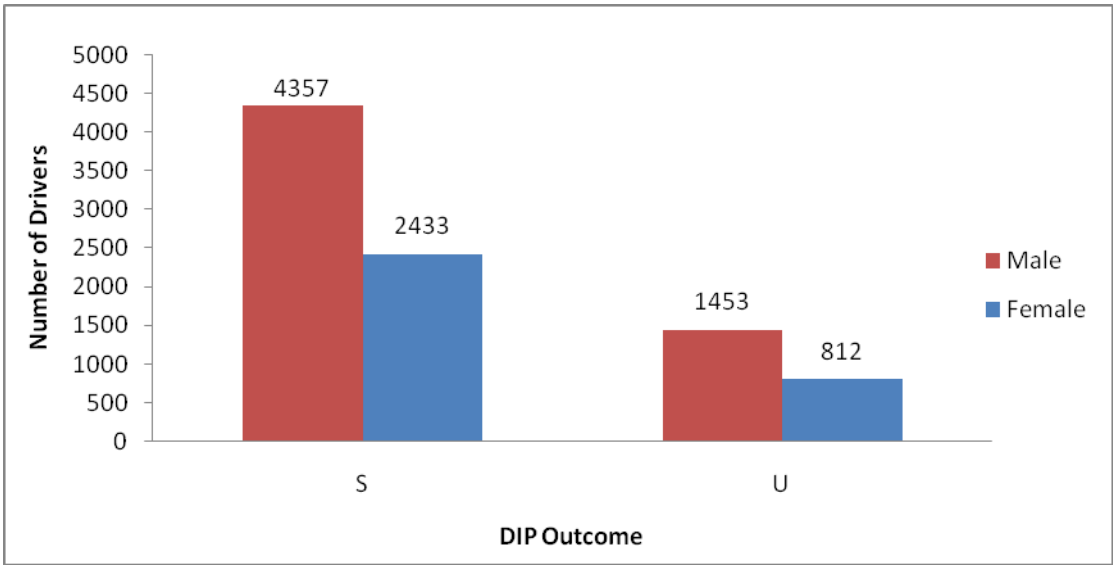

Figure 4.7. Number of drivers by gender and DIP outcome

4.4.2.2 Age and DIP Outcome

Table 4.7 shows the distribution of drivers by age and DIP outcome. For both groups, half of the driver population is between 21 and 30 years old. The second large group is the 31- to 40-year-old group, which includes 21% and 19% of the drivers in the unsatisfactory and satisfactory groups, respectively.

Table 4.7. Number of drivers by age and DIP outcome

	Unsatisfactory Group			**Satisfactory Group**		
	male	*female*	*total*	*male*	*female*	*total*
20 years old or younger	80	33	113	322	150	472
21–30 years old	**812**	**473**	**1,285**	**2,075**	**1,254**	**3,329**
31–40 years old	**304**	**169**	**473**	**824**	**478**	**1,302**
41–50 years old	166	91	257	636	318	954
51 years old or older	91	46	137	500	233	733
Total	1,453	812	2,265	4,357	2,433	6,790

4.4.2.3 Driver Convictions/Crashes and DIP Outcome

Among the total 9,055 DIP participants, 6,790 (75%) drivers completed the course satisfactorily, while 2,265 (25%) drivers were included in the "unsatisfactory" group. Among the 6,790 drivers in the "satisfactory" group, 4,946 (73%) drivers had no actions within 12 months after DIP. This preliminary finding shows the effectiveness of the DIP program in reducing subsequent actions. Therefore, the authors considered the following two groups of drivers who satisfactorily completed DIP: group 1 (S_0), which did not have any action during the probation period (12 months after DIP), and group 2 (S_1), which had a conviction or crash during the probation period. Drivers in group 2 (S_1) would have their license suspended upon their first conviction during the probation period, while the license of the drivers in the "unsatisfactory" group (U) would be suspended after the DIP date because of failure to complete or attend the course. As such, it is anticipated that the number of actions for suspended drivers would drop significantly during the suspension period compared to the actions for the overall driver population.

Figures 4.8 to 4.10 show the distribution of the number of actions by action type for drivers in the U, S_0, and S_1 groups before DIP, during the probation period, and during the period from 13 to 18 months after the DIP date, respectively. An alternative illustration of this information is provided in Appendix D.

Overall, it can be observed that the majority of actions include driver actions (convictions or crashes), followed by suspension (primarily during the probation period). Table D.1 in Appendix D shows in detail the distribution of convictions and crashes four years before the DIP date and 18 months after the DIP date.

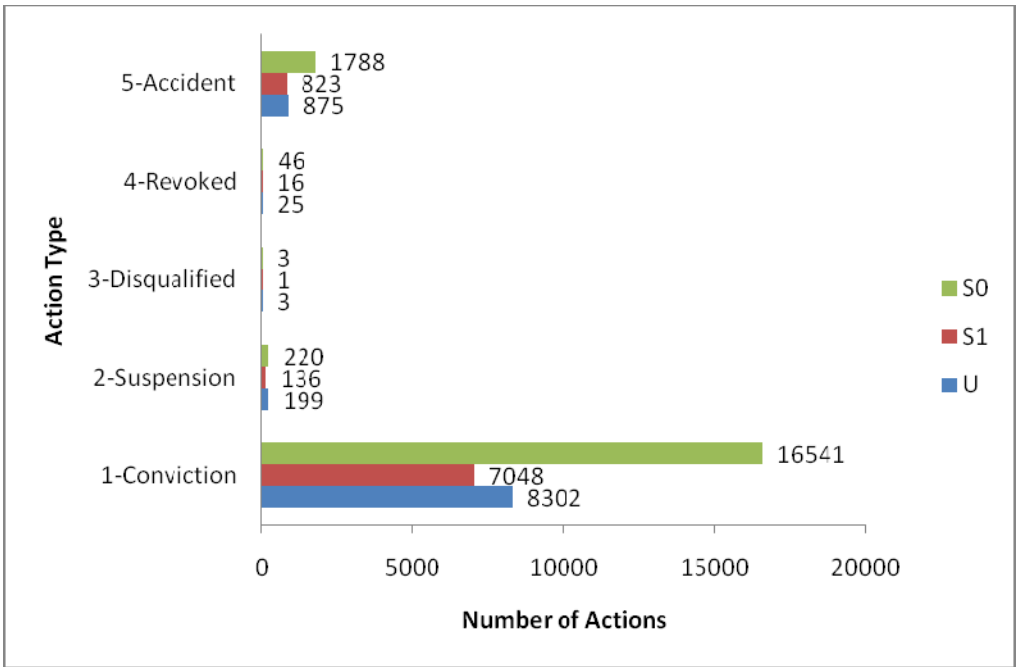

Figure 4.8. Distribution of number of actions by action type and driver group before DIP (tracked up to four years before the DIP date)

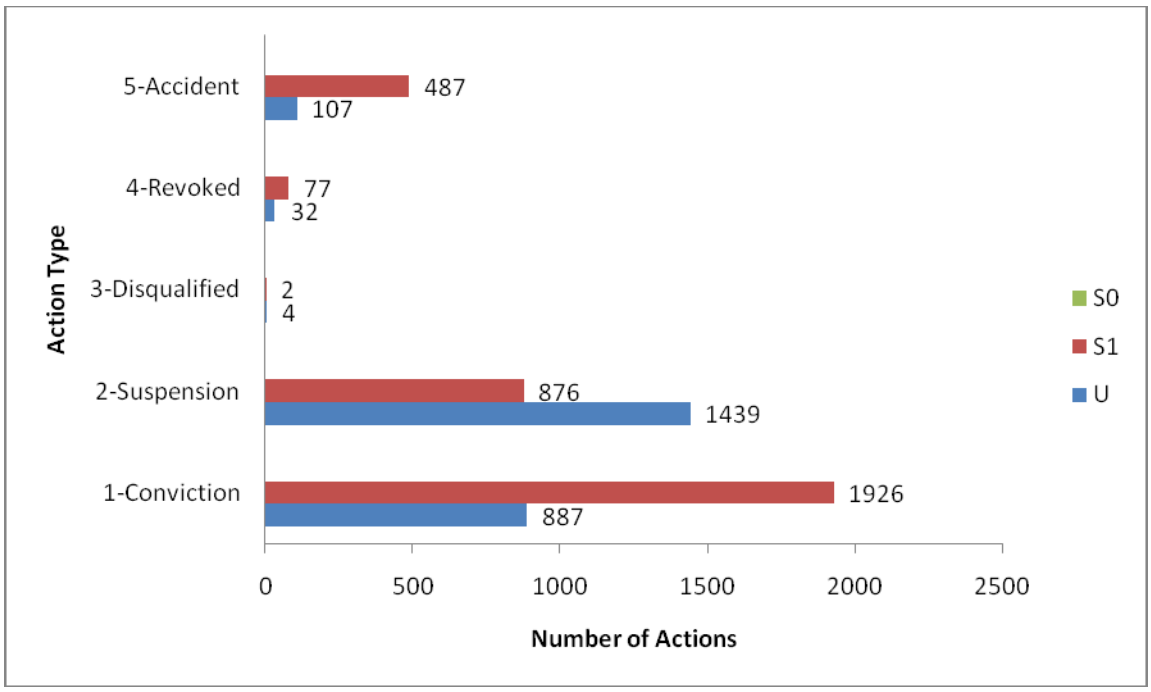

Figure 4.9. Distribution of number of actions by action type and driver group during the probation period

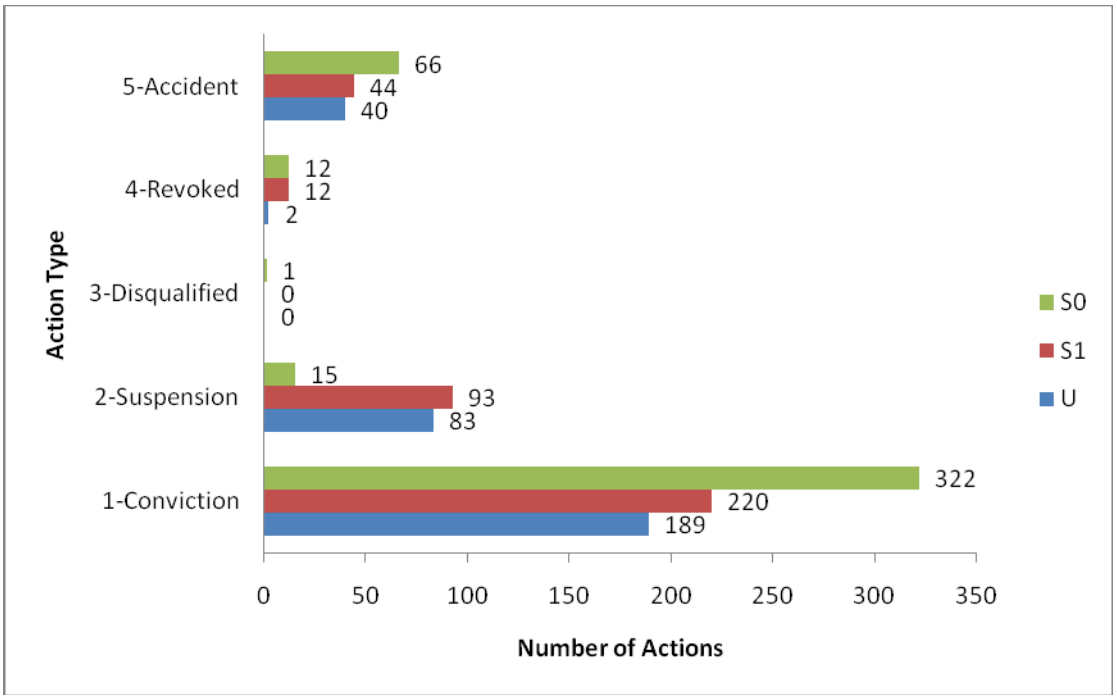

Figure 4.10. Distribution of number of actions by action type and driver group from the 13th to 18th month after DIP

It was also informative to disaggregate the differences in the number of actions by driver and compare the three groups. It is shown that one year before DIP, drivers in the S_1 group had a

conviction and crash ratio higher than that of drivers in the S_0 group and almost similar to that of drivers in the unsatisfactory group (Figure 4.11). During the probation period, drivers in the S_0 group (73% of DIP participants) did not have any actions on their record, while, on average, drivers in the S1 group had 1.04 convictions per driver and 0.26 crashes per driver (Figure 4.12). While not statistically justified yet, these preliminary findings show that one year after attending DIP, 73% of participants did not have a conviction or crash, and the other 27% had an average of 1.42 fewer convictions per driver compared to a year prior to attending the program. It should also be noted that only 7% of DIP participants were involved in a crash within 12 months after the DIP date, while the percentage of drivers who were not involved in a crash during the period from 13 to 18 months subsequent to DIP was higher (98%).

Because of license suspensions, drivers in the unsatisfactory group had lower conviction and crash ratios after the DIP date. During the period from 13 to 18 months after the DIP date, drivers in all groups had lower conviction and crash rates (Figure 4.13).

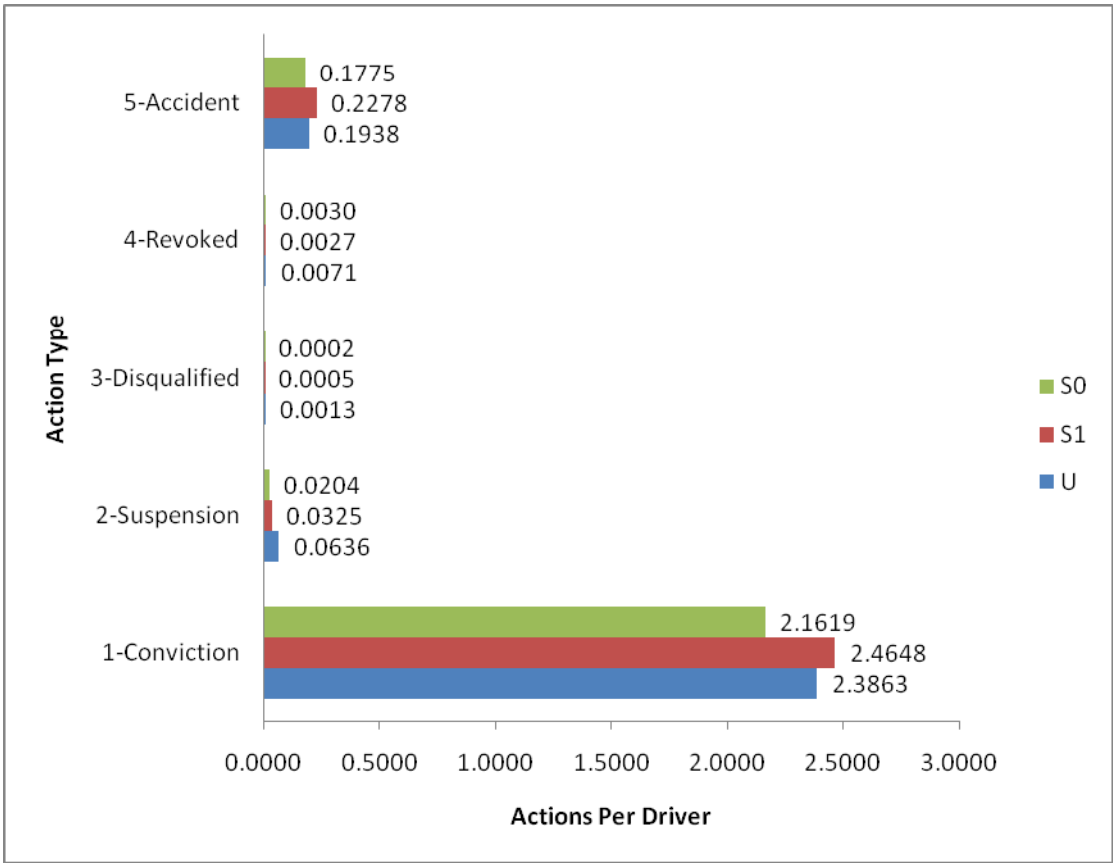

Figure 4.11. Distribution of number of actions per driver by action type and driver group one year before DIP

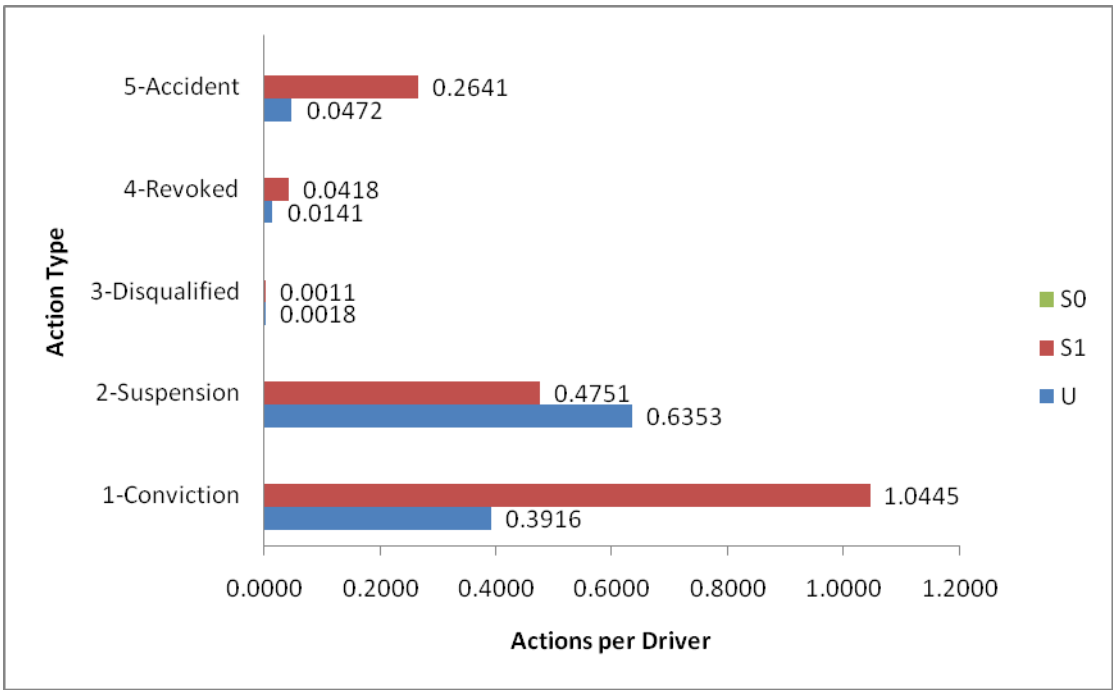

Figure 4.12. Distribution of number of actions per driver by action type and driver group during the probation period

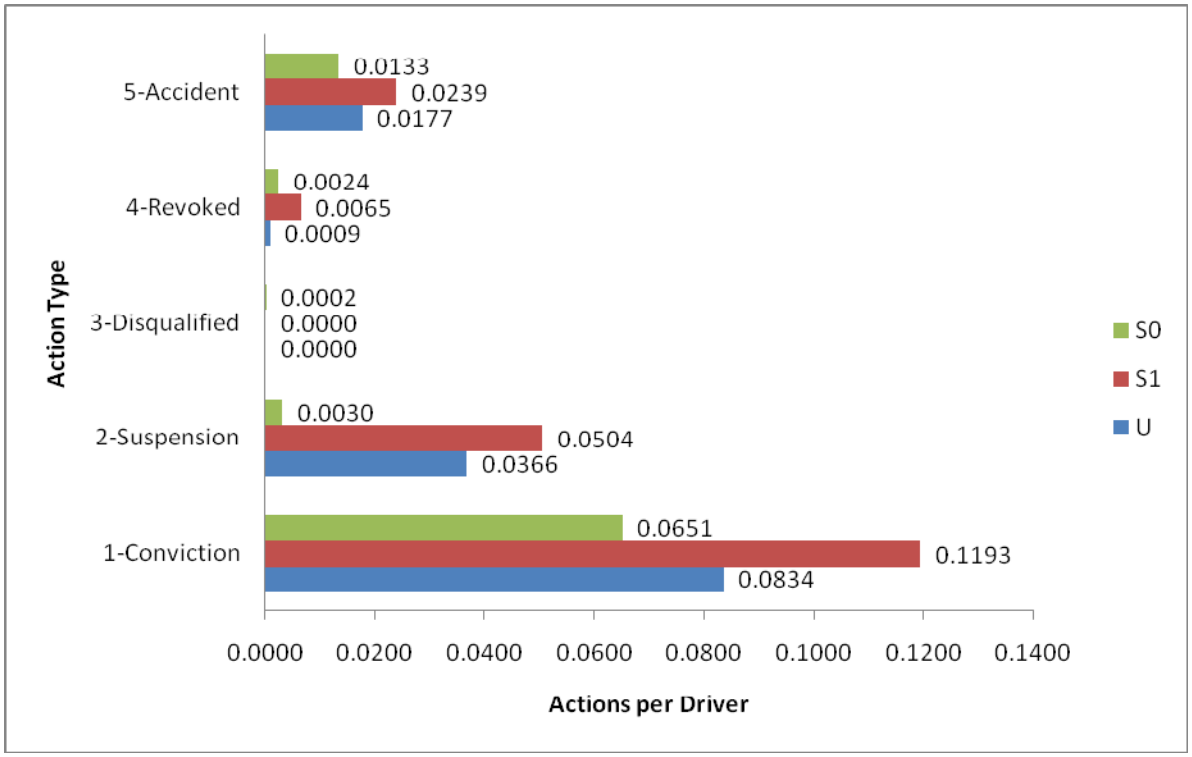

Figure 4.13. Distribution of number of actions per driver by action type and driver group from the 13th to 18th month after DIP

The distribution of convictions and crashes during the probation period and during the period from the 13th to 18th month after DIP date for all three groups under consideration (U, S_0 and S_1) is shown in Appendix D (Figures D.4–D.8). As anticipated, the number of convictions and crashes for the "unsatisfactory" group is lower than that for the S_1 group because of suspension. Overall, the number of convictions and crashes dropped significantly from the 13th to 18th month for the U and S_1 groups, probably because of suspension. The monthly fluctuation in the number of convictions and crashes could also be attributed to variation in suspension lengths.[2]

4.4.2.4 Citation Type and DIP Outcome

Figures 4.14–4.16 show the distribution of the percentage of citations by type for drivers in the "satisfactory" and "unsatisfactory" groups before DIP, during the probation period, and during the period 13 to 18 months after the DIP date, respectively.

The figures show that the same types of violations led the drivers in both groups (U and S) to attend DIP; speeding was the most common reason. During the probation period, speeding was still the major reason for a citation. After speeding, no driver's license and driving while suspended were frequent reasons for receiving a citation after DIP.

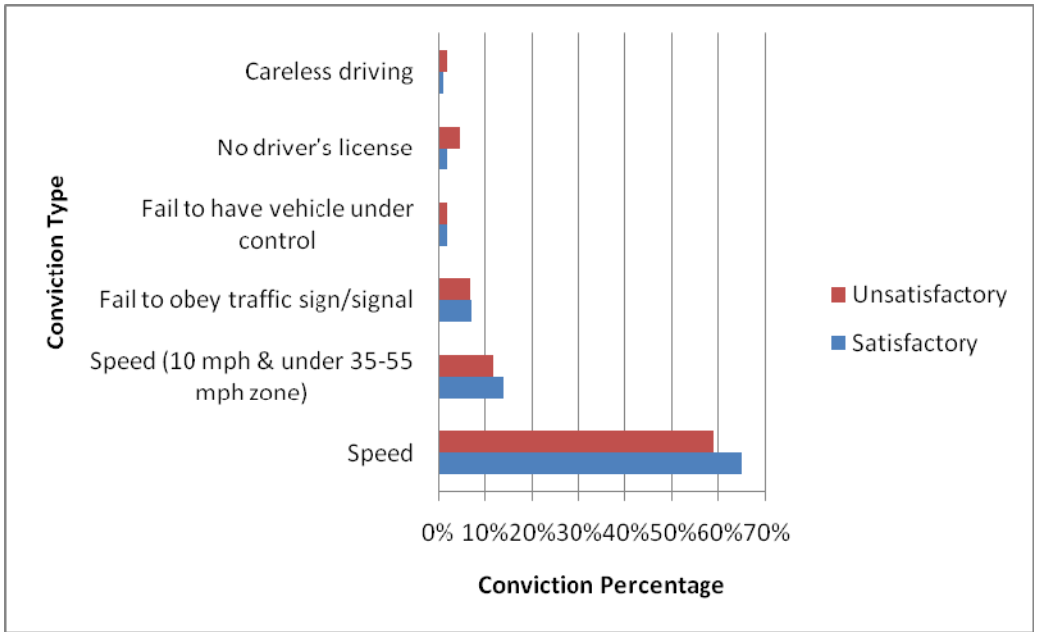

Figure 4.14. Percentage of citations by citation type and driver group before DIP

[2] Suspension lengths may vary; for example, (1) if a driver receives three tickets and does not attend DIP, the license is suspended for 90 days, (2) if a driver receives four tickets and does not attend DIP, the license is suspended for 120 days, (3) if a driver receives five tickets, s/he is not eligible for DIP and the license is suspended. If a driver is caught driving with a suspended license, the length of the existing suspension is doubled.

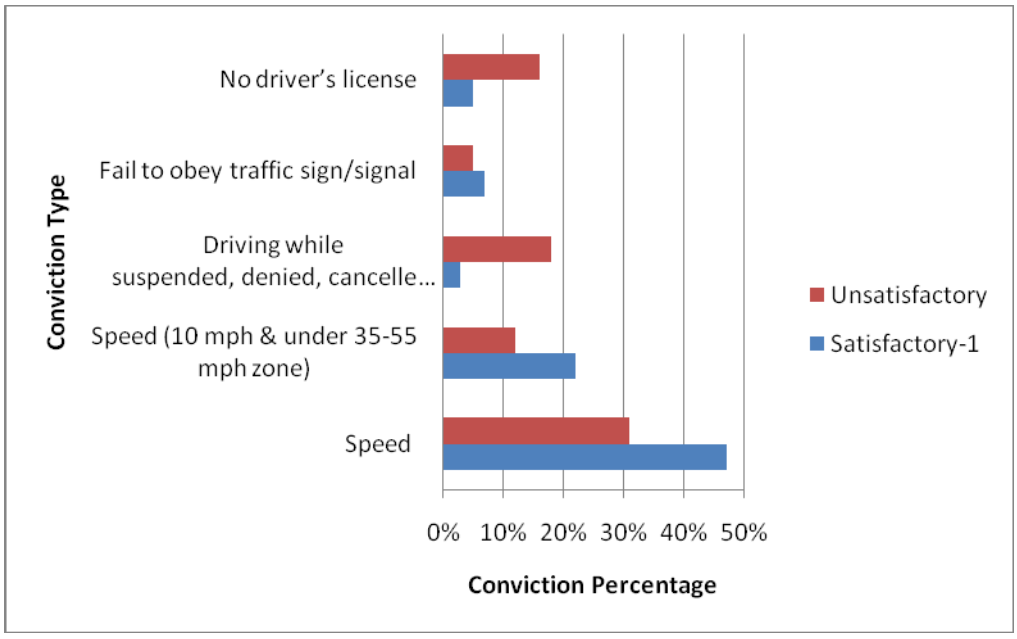

Figure 4.15. Percentage of citations by citation type and driver group during the probation period

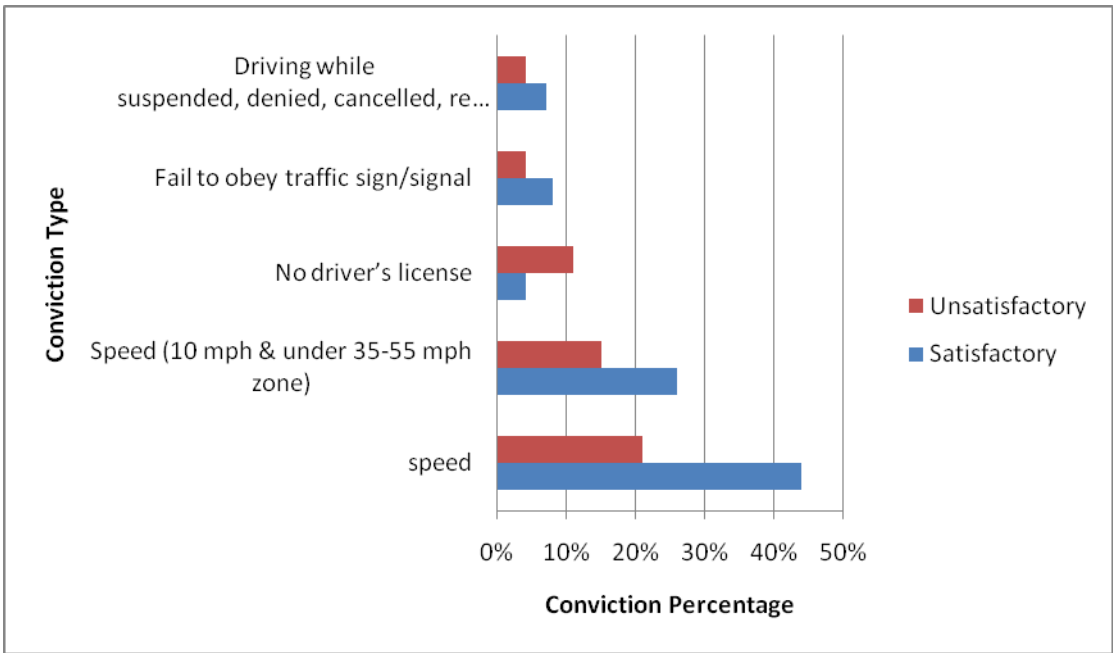

Figure 4.16. Percentage of citations by citation type and driver group from the 13th to 18th month after DIP

4.4.2.5 Driver Convictions, Location, and DIP Outcome

The following material examines any spatial differences in the program's effectiveness depending on where the driver improvement program is offered in Iowa. Figure 4.17 shows the

percentage of drivers who completed DIP at each community college and did not have any action during the probation period. The percentages are in the range of 60%–80%. Community colleges in Marshalltown, Council Bluffs, and Sheldon had the highest percentage of drivers who did not have any action during the first year after attending DIP.

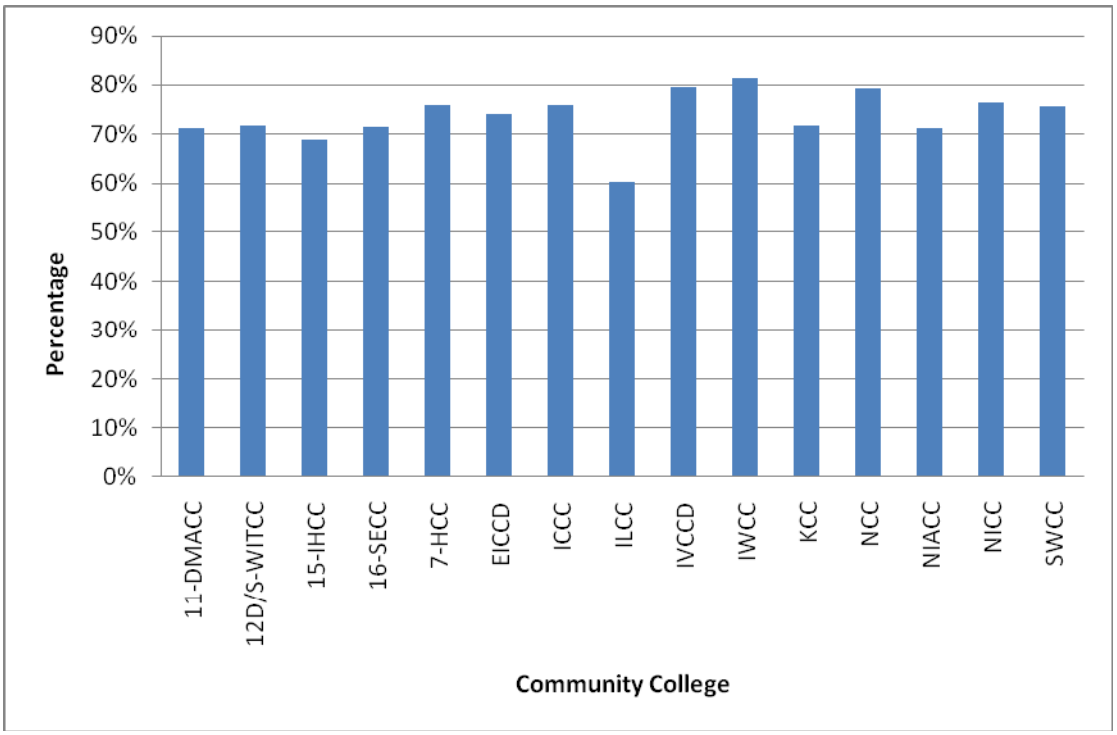

Figure 4.17. Percentage of drivers who completed DIP at each community college and did not have any action during the probation period

Figure 4.18 shows the percentage change in the number of subsequent convictions during the probation period and the period from 13 to 18 months after the DIP date per driver who completed the DIP at each community college and who had actions during the probation period (S_1). The percentage changes range from 64% to 78% during the probation period and from 94% to 100% during the period 13 to 18 months after DIP date. Drivers who attended DIP in Emmetsburg, Marshalltown, and Denison/Sioux City had the highest percentage decrease in subsequent convictions during the probation period, while drivers who completed the course in Fort Dodge, Ottumwa, Waterloo, and Creston had the greatest decrease in subsequent convictions during the period 13 to 18 months following DIP.

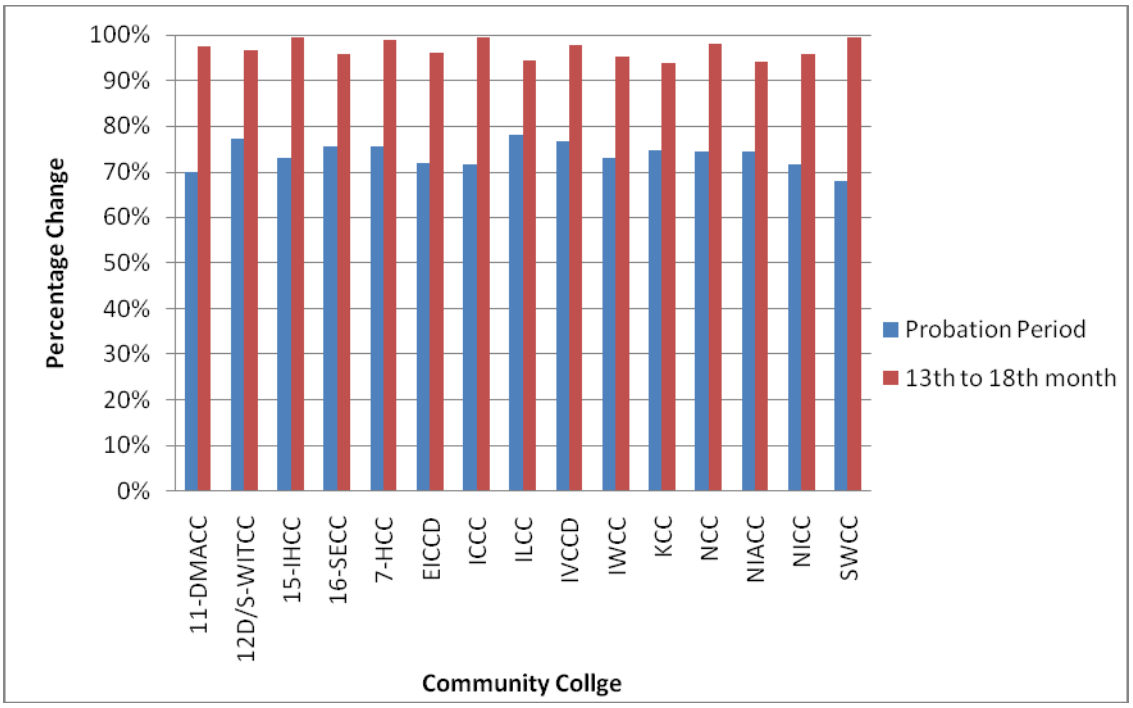

Figure 4.18. Percentage change in subsequent convictions per driver

4.5 Summary

In this chapter, the data on driver citations, convictions, crashes, and driver education training history were summarized and interpreted using descriptive analysis techniques and graphical representations. Preliminary findings showed that 73% of DIP participants did not have any convictions and 93% of DIP participants were not involved in a crash during the probation period (12 months after DIP date). While these findings suggest a reduction in convictions and crashes for drivers who attended the DIP, there is a need for further analysis to statistically verify these preliminary findings. The results of the statistical analyses are presented in Chapter 5.

5. STATISTICAL DATA ANALYSIS

5.1 Overview

For this chapter, the authors applied statistical methods to examine the effectiveness of Iowa's DIP, measured as the reduction in the number of violations after drivers attended the program. Two evaluation periods were considered: one year after DIP date and the period from 13 to 18 months after the DIP date. First, the authors conducted statistical tests to compare, for the drivers who had satisfactorily completed DIP, the conviction frequency before and after attending DIP. In addition, probabilistic models were used to estimate the likelihood of conviction following DIP. The factors examined included age, gender, outcome, and location, as well as interaction effects among these factors. Evaluating the effect of location on the occurrence of subsequent convictions can provide insights into whether there are any spatial differences in the program's effectiveness depending on where the driver improvement program is offered in Iowa. Next, count data models were used to investigate the factors that influence the frequency of subsequent convictions as a function of driver characteristics and conviction/crash history. Finally, duration models were developed to examine whether the driver improvement program has lasting effects in reducing violation involvement rates or whether the effects (if any) wane after drivers complete the program. Assessing this time frame could be beneficial if the MVD wishes to experiment with follow-up driver interventions to ensure a longer-lasting effect.

It should be noted that, while it was of interest to examine the DIP's effectiveness in terms of crashes, only 7% of DIP participants were involved in a crash within 12 months after the DIP date, and only 2% of DIP participants were involved in a crash during the period from 13 to 18 months after DIP (as mentioned in Section 4.4). Because of the low variation in the subsequent number of crashes, the analysis focused on the effects of Iowa's DIP on subsequent conviction rates.

5.2 Methodology

5.2.1 Statistical Tests

Statistical tests were conducted to compare the conviction rates of different groups of drivers ("satisfactory" versus "unsatisfactory" completion) as well as the same groups of drivers before and after DIP. Statistically significant differences in number of convictions among the aforementioned groups were explored. The Z-test statistic was used to compare these differences among two normally distributed populations, while nonparametric tests (such as the Wilcoxon signed-rank test and the Wilcoxon rank-sum test) were applied in cases where the requirement for normality was not met. The Wilcoxon signed-rank test is a common nonparametric test for differences between two related samples (for example, the same group of drivers before and after DIP), while the Wilcoxon rank-sum test is a common nonparametric test for differences between two mutually independent samples (for example, the "satisfactory" and "unsatisfactory" groups).

5.2.2 Binary Probit Model

In modeling conviction occurrence after DIP, consideration was given to two possible discrete outcomes: whether a driver had a conviction during the first year after DIP or a conviction during the period from 13 to 18 months after DIP date.

For two outcomes, the binary probit model defines a function that determines conviction occurrence as

$$W_{in} = \beta_i x_{in} + \varepsilon_{in}, \quad (1)$$

where W_{in} is the function that determines the probability of discrete outcome i for driver n, x_{in} is a vector of measurable characteristics (driver characteristics and history) that determine conviction occurrence for driver n, β_i is a vector of estimable coefficients, and ε_{in} is an error term accounting for unobserved effects influencing the conviction occurrence outcome i for driver n.

It can be shown that if ε_{in} is assumed to be normally distributed (McFadden 1981), then a standard binary probit model results, and the probability $P_n(i)$ of outcome i is given as

$$P_n(i) = \frac{EXP[\beta_i x_i]}{1 + EXP(\beta_i x_i)} \quad (2)$$

5.2.3 Count Data Models

The frequency of subsequent convictions is properly modeled using count data models, the most popular of which are Poisson and negative binomial regression models. One requirement of the Poisson distribution is that the mean of the count process equals its variance. When the variance is significantly larger than the mean, the data are said to be overdispersed and can be properly modeled using a negative binomial model (Washington et al. 2003). In this study, the frequency of convictions following DIP was estimated using a negative binomial model (because overdispersion was present).

The negative binomial regression model is an extension of the Poisson regression model, which allows the variance of the process to differ from the mean. For a non-negative integer variable, Y, with observed frequencies y_i, $i = 1,\ldots,N$, the probability of y_i (in this case, driver convictions) at i is given by

$$P(y_i) = \frac{EXP(-\lambda_i)\lambda_i^{y_i}}{y_i!}, \quad (3)$$

where λ_i is the Poisson parameter for *i*, which is equal to the expected frequency of driver convictions at *i*, $E[y_i]$.

The log-linear model form used in this study to predict the expected number of convictions subsequent to DIP is as follows:

$$ln\ (\lambda_i) = \beta_i \cdot x_i + \varepsilon_i \ , \tag{4}$$

where $EXP(\varepsilon_i)$ follows a gamma distribution with mean 1.0 and variance a^2. This model has an additional parameter, α, which is often referred to as the overdispersion parameter, such that

$$VAR[y_i] = E[y_i] \cdot [1 + \alpha \cdot E[y_i]] \tag{5}$$

5.2.4 Duration Models

Survival analysis is applied to determine the period of time (number of days) during which the effects of the driver improvement courses remain significant. Duration data are properly modeled with the use of estimation techniques based on hazard functions (Washington et al. 2003). The distribution of the hazard function can be taken from a class of distributions that includes the extreme value, normal, logistic, and, by using a log transformation, the exponential, Weibull, log-logistic, and others. Plots of the survival and hazard distributions obtained using nonparametric methods can guide the selection of the parametric distribution. A visual inspection of the hazard curves (for example, Figure 5.1) shows that the hazard of a conviction after the DIP date is monotonically increasing in duration. On the basis of these observations and statistical evaluation, the Weibull distribution was chosen.

The Weibull distribution allows for monotonic hazard functions and has the following density function:

$$f(t) = \lambda\ P(\lambda t)^{P-1}\ EXP[(-\lambda t)^P]\ ,\ \lambda > 0, P > 0 \tag{6}$$

The hazard function is the conditional probability that an event will occur (for example, a conviction) between time *t* and $t + dt$, given that the event has not occurred up to time *t.* The Weibull distribution's hazard is given as follows:

$$h(t) = (\lambda\ P)(\lambda t)^{P-1} \tag{7}$$

In a hazard function, the numerical magnitudes of the coefficients β may not be as informative as the hazard ratios. A hazard ratio is defined as $EXP(\beta)$ and can be interpreted as follows: for indicator variables with values of 1 and 0 (for example, a DIP outcome takes the value of 1 if satisfactory and 0 for unsatisfactory), a hazard ratio shows the ratio for those with a value 1 (satisfactory group) to the estimated hazard for those with a value of 0 (unsatisfactory group).

For quantitative variables (such as age), the transformation *100[EXP(β)-1]* is used, which gives the percent change in the hazard for each one-unit increase in the variable (Allison 1995).

5.3 Estimation Results

5.3.1 Statistical Tests

The estimation results of the statistical tests before and after DIP for the drivers who completed DIP satisfactorily showed that the reduction in the number of convictions after DIP was statistically significant, both during the probation period (*$p<0.0001$*) and during the period from 13 to 18 months following DIP (*$p<0.0001$*).

It was also of interest to compare different groups of drivers (the "satisfactory" versus "unsatisfactory" groups). Recall that 73% of drivers had no actions within 12 months after DIP (S_0), while 27% of drivers had a conviction or crash during the probation period (S_1). As such, statistical tests were conducted for the U and S_1 groups to examine statistically significant differences in conviction reductions based on the DIP outcome. Note that, theoretically, drivers in both the U and S_1 groups should have a sanction (i.e., license suspension) during the probation period. It was found that the number of convictions that drivers in the S_1 group incurred was significantly lower than that for drivers in the U group (*$p<0.0001$)* during the probation period. However, no statistically significant differences in the number of subsequent convictions between the U and S groups were found during the period from 13 to 18 months following DIP (*$p=0.242$).* The outputs of the tests are provided in Appendix E.

While these tests provide significant evidence of the DIP's effectiveness in subsequent reductions, they cannot explain differences in effectiveness by gender, age, and driver history or by spatial differences (location). The next sections examine the effect of age, gender, outcome, and location and the interaction effects among these factors on the occurrence and frequency of subsequent convictions.

5.3.2 Conviction Occurrence after DIP

Table 5.1 shows the binary probit model estimation results for conviction occurrence after DIP. Note that separate models were estimated for conviction occurrence during the probation period and during the period from 13 to 18 months after the DIP date.[3] The model outputs are provided in section E.2 in Appendix E.

[3] The authors used the likelihood ratio test (Washington et al. 2003, p. 282), using the same variables in all three models (all data, conviction data during the probation period, and conviction data during the period from 13 to 18 months after the DIP date), and the resulting X^2 statistic showed that it was statistically significant to estimate two separate models.

Table 5.1. Binary probit model estimation results for conviction occurrence after DIP

	Probation Period		13th to 18th Month	
Variable	**Estimated Coefficient**	**t-Statistic**	**Estimated Coefficient**	**t-Statistic**
Constant	-0.898	-29.715	-1.871	-17.28
DIP outcome: unsatisfactory	0.206	5.617		
Male driver between 21 and 30 yrs old	0.383	4.856		
Female driver between 21 and 30 yrs old	0.398	4.894		
Driver between 21 and 30 yrs old			0.418	3.824
Driver between 21 and 30 yrs old, sent to DMACC	-0.150	-2.814		
Driver between 21 and 30 yrs old with no crash before DIP	-0.176	-2.338		
Driver between 21 and 30 yrs old with one crash before DIP	-0.214	-2.644		
Driver who completed DIP at DMACC	0.165	3.628	-0.160	-3.098
Community college: EICCD	-0.099	-2.109		
Community college: KCC			0.123	2.242
Male driver with five convictions before DIP	0.172	3.307		
Female driver with one conviction before DIP	-0.334	-4.052	-0.353	-2.763
Female driver with three convictions before DIP	-0.137	-2.728		
Number of Observations	9,055		9,055	
Log-likelihood at convergence	-4,816.9		-2,197.23	
Log-likelihood at zero	-4,879.9		-2,221.36	

It was found that drivers who did not attend or satisfactorily complete DIP were more likely to have subsequent conviction(s) during the probation period than drivers who completed DIP. This confirms our preliminary findings about the effectiveness of DIP in reducing subsequent convictions. As shown in Table 5.1, several interaction factors contribute to the probability of subsequent conviction. Young drivers (between 21 and 30 years old) were more likely to incur a conviction, with females in that age group having a higher probability than male drivers. However, not all drivers in that age group had a higher probability of subsequent convictions; young drivers who were instructed to attend DIP at DMACC in Ankeny and young drivers with a low crash history (0 or 1 crashes) before DIP were likely to have a conviction during the probation period. Drivers who completed DIP at DMACC in Ankeny or who were male with a high conviction history before DIP (five convictions) had a higher risk for conviction, while drivers who attended EICCD in Bettendorf or who were female with one to three convictions before DIP were less likely to have a conviction during the probation period after DIP.

Turning to the period from 13 to 18 months after DIP, young drivers (between 21 and 30 years old) were more likely to incur a conviction, while females who had one conviction before DIP had a lower risk for subsequent convictions. This finding was consistent with the results during the probation period. In contrast to the results during the probation period, drivers who completed DIP at DMACC in Ankeny were less likely to incur subsequent convictions. Finally, drivers who were instructed to attend DIP at KCC in Cedar Rapids were more likely to have subsequent convictions.

The authors speculate that these findings are picking up differences in driver behavior in the presence of enforcement (or lack thereof) and DIP instruction across different geographical areas in Iowa. While the authors could not explicitly examine the differences in the level of enforcement or DIP instruction across the community colleges that offer DIP, differences were examined in the attributes of the driver population who attended DIP at the three colleges with the highest DIP participation rates (DMACC, EICCD, and KCC). Table 5.2 shows the distribution of drivers at each college by gender and age group.

Table 5.2. Distribution of drivers in the three community colleges by gender and age

		Community College			
		DMACC	**EICCD**	**KCC**	**Grand Total**
Female drivers	20 years old or younger	73 (2%)	44 (4%)	18 (1%)	135
	21–30 years old	580 (19%)	232 (19%)	299 (22%)	1,111
	31–40 years old	217 (7%)	94 (8%)	96 (7%)	407
	41–50 years old	152 (5%)	47 (4%)	69 (5%)	268
	51 years old or older	93 (3%)	30 (2%)	44 (2%)	167
Total		1,115 (36%)	447 (37%)	526 (38%)	2,088
Male drivers	20 years old or younger	137 (4%)	64 (5%)	39 (3%)	240
	21–30 years old	975 (31%)	368 (30%)	452 (33%)	1,795
	31–40 years old	401 (13%)	163 (13%)	192 (14%)	756
	41–50 years old	303 (10%)	92 (8%)	105 (8%)	500
	51 years old or older	190 (6%)	74 (6%)	75 (5%)	339
Total		2,006 (64%)	761 (63%)	863 (62%)	3,630
Grand Total		3,121(34%)	1208(13%)	1389(15%)	5,718

It can be inferred that drivers who were instructed to attend DIP in DMACC have similar characteristics to the average driver in the final sample (see Table 4.6). Female drivers were slightly overrepresented at EICCD and KCC (37% and 38%, respectively) compared to 36% of female drivers in the total sample. Turning to the distribution of drivers by age group, the following can be observed: younger drivers (20 years old or younger) were overrepresented at EICCD and underrepresented at KCC; drivers between 21 and 40 years old were overrepresented at KCC, while older drivers (older than 50 years old) were underrepresented; and drivers

between 31 and 40 years old were overrepresented at EICCD, while older drivers (older than 41 years old) were underrepresented.

5.3.3 Frequency of convictions subsequent to DIP

Table 5.3 shows the negative binomial model estimation results for the frequency of convictions after DIP. Note again that separate models were estimated for frequency of convictions during the probation period and during the period from 13 to 18 months after the DIP date.[4] The model outputs are provided in section E.3 of Appendix E.

Table 5.3. Negative binomial regression model for frequency of convictions

	Probation Period		**13th to 18th Month**	
Variable	**Estimated Coefficient**	**t-Statistic**	**Estimated Coefficient**	**t-Statistic**
Constant	-1.469	-28.81	-2.910	-21.78
DIP outcome: unsatisfactory	0.434	7.56		
Driver between 21-30 yrs old	0.589	5.19	0.494	3.50
Driver between 31-40 yrs old			0.484	2.98
Driver between 41-50 yrs old			0.433	2.52
Driver between 21and 30 yrs old, sent to DMACC	-0.241	-2.94		
Driver between 21and 30 yrs old with no crash before DIP	-0.265	-2.26		
Driver between 21and 30 yrs old with one crash before DIP	-0.270	-2.44		
Driver who completed DIP at DMACC	0.350	4.81	-0.252	-2.38
Driver who completed DIP at KCC	-0.247	-2.59	0.566	3.86
Female driver with one conviction before DIP	-0.403	-4.50	-0.571	-3.18
Female driver with three convictions before DIP	-0.189	-2.84		
Driver with five convictions before DIP			0.231	2.03
Overdispersion parameter α	1.181	13.49	3.978	7.80
Number of Observations	9,055		9,055	
Log-likelihood at convergence	-6,415.61		-2,531.32	
Log-likelihood at zero	-6,613.61		-2,636.91	

[4] The authors used the likelihood ratio test (Washington et al. 2003, p. 282), using the same variables in all three models (all data, conviction data during the probation period, and conviction data during the period from 13 to 18 months after the DIP date), and the resulting X^2 statistic showed that it was statistically significant to estimate two separate models.

It was found that there are common factors that affect the probability of a driver incurring a conviction following DIP and the number of subsequent convictions during the probation period. The most notable are DIP outcome, with an unsatisfactory completion leading to more subsequent convictions; low crash history for young drivers and low conviction history for female drivers, leading to fewer subsequent convictions; and DIP location. Turning to the period from the 13th to 18th month after DIP, drivers between 21 and 50 years of age and drivers with a high conviction history (five convictions) before DIP were more likely to have a higher frequency of subsequent convictions, while drivers who completed DIP at DMACC in Ankeny and KCC in Cedar Rapids were more likely to have fewer convictions during the period from the 13th to 18th month after DIP. Again, these findings are picking up differences in driver attributes and behavior in the presence of enforcement (or lack thereof) and DIP instruction across different geographical areas in Iowa.

5.3.4 Survival analysis

This section examines whether the driver improvement program has lasting effects in reducing violation involvement rates or whether the effects (if any) wane after the completion of the program. Survival analysis was applied to determine the period of time until the first conviction.

5.3.4.1 Hazard Plots

Figure 5.1 shows the probability that the first conviction will occur within 100 days, 200 days, and so on after the DIP date. Two different hazard functions are shown, which correspond to the two DIP outcomes (outcome takes the value of 1 if satisfactory and 0 if unsatisfactory). The hazard curve for the "satisfactory" outcome is below the curve for the "unsatisfactory" outcome, which suggests that the probability of having a conviction (for example, within 100 days) is lower for the drivers who attended DIP. The positive effect of satisfactory DIP completion on survival time (that is, time until the first conviction) is statistically significant within 13 months (or 390 days) after the DIP date. The two curves are virtually indistinguishable after 13 months following the DIP date. This suggests that reinforcement within the first year after the DIP date may prove helpful.

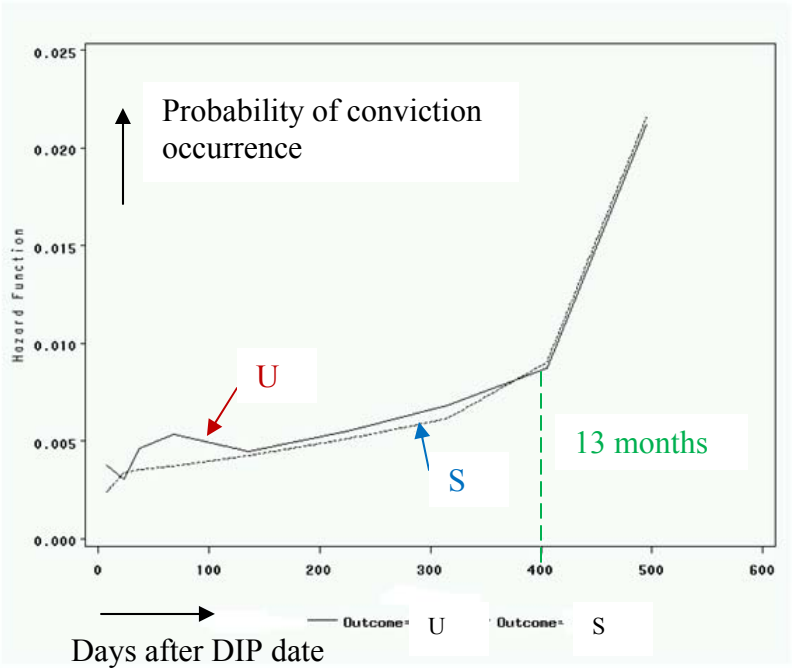

Figure 5.1. Graph of hazard functions (number of days until first conviction) for the two DIP outcomes

Further, the authors examined the effect of satisfactory DIP completion on survival time for drivers with a low conviction history (up to two convictions) before DIP. It was found that the probability of conviction occurrence was higher for drivers in the "unsatisfactory" group and lower for those drivers in the "satisfactory" group, but only within the first six months after DIP. Statistically significant differences in hazard functions were also identified by gender (only for time until the first conviction) and age group (for time until the first conviction). It was found that male drivers are more likely to have their first conviction following DIP sooner than female drivers. However, the differences by gender are less discernible one year after the DIP date. Turning to the effect of age, it was found that the probability of having a conviction is higher for younger drivers (up to 20 years old) than for older drivers. Section E.4 of Appendix E shows the period of time until the first conviction by gender, age, and conviction history/outcome.

5.3.4.2 Hazard Model for Conviction Occurrence

While the plots provided useful insights, the effect of only one variable (outcome, gender, or age) could be examined each time. In view of this, a hazard model was developed to show the significance of each factor on conviction occurrence in a multivariate context. Table 5.4 shows the hazard model estimation results. The model output is provided in section E.5 of Appendix E.

Table 5.4. Hazard model parameter estimates of the duration (number of days) until the first conviction after the DIP date

Variable	Estimated Coefficient	Hazard Ratio[a]	*p-value*
Constant	–5.312		<0.0001
Male driver	0.089	1.093	0.0360
Age	–0.106	0.899	<0.0001
Number of convictions before DIP date	0.058	1.059	<0.0001
DIP Outcome: satisfactory	–0.141	0.869	0.0031
Driver who completed DIP at DMACC	0.124	1.131	0.0166
Community college: KCC	–0.094	0.910	0.0917
σ (scale)	0.745	0.012	<0.0001
P (distribution parameter)	1.343	0.022	<0.0001
Number of observations		2,486	
Log-likelihood at convergence		-3,262.74	
Log-likelihood (only constant)		-3,294.53	

[a] Defined as *EXP(β)*

It was found that the hazard of conviction occurrence for male drivers was 9% greater than for female drivers, while the hazard for older drivers was 90% lower than for younger groups. In other words, both female drivers and older drivers have higher survival times than male and younger drivers. For each additional conviction before DIP, the hazard for conviction increased by 6%. In a similar vein, the hazard for drivers who completed the course satisfactorily is 87% lower than those drivers in the "unsatisfactory" group. Interestingly, the survival times of those drivers who completed the course at DMACC in Ankeny were lower than for the other drivers in the sample, while the expected time to the first conviction was higher for drivers who were instructed to attend DIP at KCC in Cedar Rapids. This could be attributed to a number of reasons, such as spatial differences in the level of enforcement and differences in driver attributes and behavior (see Table 5.2).

5.4 Summary

In this chapter, the results of the statistical analysis were presented. For drivers who completed the DIP satisfactorily, the statistical tests showed a significant reduction in the number of convictions after DIP during the probation and during the period 13 to 18 months after DIP. However, the positive effect of satisfactory DIP completion on survival time (that is, time until the first conviction) is statistically significant within 13 months after the DIP date. The likelihood and frequency of subsequent convictions also depends on other factors such as age, driver history, and DIP location and the interaction effects among these factors.

6. CONCLUSIONS AND RECOMMENDATIONS

This study examined the effectiveness of Iowa's DIP by determining the reduction in the number of driver convictions after drivers attended the DIP. The analysis involved a random sample of 9,055 drivers who had been instructed to attend DIP. The sample was divided into two groups based on the DIP outcome, satisfactory or unsatisfactory completion. The "satisfactory" group consisted of drivers who successfully completed the DIP course. The "unsatisfactory" group consisted of drivers who did not complete or did not attend the DIP course after they received a letter to attend DIP. Interestingly, the distribution of men and women in each group was the same (64% and 36%, respectively), which suggests that there was no difference between male and female drivers with respect to the DIP outcome. Actions were tracked four years before the DIP date. The DIP date refers to the date when drivers were instructed to attend DIP. Action types were categorized into Iowa DOT actions or sanctions (suspension, disqualified, and revoked license) and driver actions (convictions and crashes). It should be noted that the license of the drivers in the "unsatisfactory" group would be suspended, while the license of the drivers in the "satisfactory" group would be suspended after DIP upon their first conviction within the probation period. The probation period (one year after the date drivers were sent to DIP) and the period from 13 to 18 months after the DIP date were used to examine the effectiveness of the program on reducing subsequent driver actions.

The evaluation of Iowa's DIP showed that there is evidence of effectiveness in terms of reducing the number of convictions after attending DIP. Among the total 9,055 drivers in the sample, 6,790 (75%) drivers completed the course satisfactorily, while 2,265 (25%) drivers were included in the "unsatisfactory" group. Among the 6,790 drivers in the "satisfactory" group, 73% of drivers had no actions and 93% were not involved in a crash during the probation period. This finding shows a decrease in subsequent actions for the majority of DIP participants. The remaining 27% had an average of 1.42 fewer convictions per driver compared to a year prior to attending the program. During the period from 13 to 18 months after the DIP date, drivers who completed the DIP had much lower conviction and crash rates than they did prior to attending the program. Specifically, only 2% of DIP participants were involved in a crash during the period 13 to 18 months after attending DIP. Due to the low variation in the subsequent number of crashes, the analysis focused on the effects of Iowa's DIP on conviction rates after attending DIP.

Turning to the type of violation, similar violation types led the drivers in both groups (unsatisfactory [U] and satisfactory [S]) to attend DIP, with speeding being the most common reason. During the probation period, speeding was still the major reason for a citation. After speeding, no driver's license and driving while suspended were frequent reasons for receiving a citation after attending DIP. Therefore, addressing speeding violations or driving while suspended can be one of the principal objectives of the program.

Statistical methods, such as statistical tests and econometric models, were used to examine the effectiveness of Iowa's DIP in reducing the number of convictions after the program. For drivers who completed DIP satisfactorily, the statistical tests showed a significant reduction in the number of convictions during the probation period and during the period 13 to 18 months after DIP. Comparing the subsequent number of convictions between the two groups during the

probation period showed that drivers who completed DIP had a lower number of convictions than drivers in the "unsatisfactory" group. However, the number of convictions during the period 13 to 18 months after DIP showed no statistically significant differences between the U and S groups.

In addition, probabilistic models were developed to examine the effect of factors such as age, gender, outcome, location, and interaction effects among these factors on occurrence and frequency of subsequent convictions. It was found that drivers who did not attend or complete DIP satisfactorily were more likely to have convictions during the probation period than drivers who completed DIP satisfactorily. However, the DIP outcome was not a significant predictor of convictions during the period from 13 to 18 months after DIP. This finding is consistent with the survival analysis results, where it was found that the positive effect of satisfactory DIP completion on survival time (that is, time until the first conviction) is statistically significant within 13 months (or 390 days) after the DIP date. In view of this result, intervention within the first year after the DIP date may prove helpful. Moreover, consideration should be given to intervention measures for drivers in the "unsatisfactory" group. These drivers did not attend (or complete) the DIP course, continued to drive while suspended, and their driving behavior warranted a subsequent conviction (or multiple).

Some other notable factors that were identified in the statistical analysis include age, with younger drivers being at higher risk for subsequent convictions (the hazard for older drivers is 90% lower than for younger groups); driver history, with low crash history for young drivers and low conviction history for female drivers leading to less subsequent convictions, while males with a high conviction history before DIP were at higher risk for conviction; and DIP location, with drivers who completed DIP in Ankeny at lower risk during the period 13 to 18 months after DIP, while drivers who completed DIP in Cedar Rapids were less likely to have convictions during the probation period. The findings on the effect of location are likely picking up differences in driver behavior in the presence of enforcement (or lack thereof) and DIP instruction across different geographical areas in Iowa. A closer examination of DIP instruction across the 17 community colleges could help explain these spatial differences in DIP effectiveness.

Additional recommendations related to the adoption of other driver education training mechanisms and materials for reducing the traffic conviction rate of high-risk drivers, in particular, are summarized as follows:

Iowa offers certain driving improvement programs, such as driver improvement school and the policy of suspending the driving privileges of habitual violators, serious violations, and countable moving violations. Iowa also implements the GDL program for drivers under 17 years old. The Iowa DOT can also consider adopting other driver education training mechanisms and materials, such as home-study courses (online courses), which are low-cost but not less effective than the in-person study, and implementing a mature driver improvement program, which is essential to retrain older drivers in new skills and knowledge.

Advisory or warning letters should also be considered as a low-cost, early intervention measure to advise/warn drivers before they become high-risk drivers and/or are involved in a crash. Previous work has established the effectiveness of driver improvement letters, advisory letters, and warning letters in reducing safety risk and has found that the effectiveness of each type of letter varied by age group. For example, standard letters, which emphasize the threat of subsequent crashes or violations, are more effective for younger male and female drivers, while soft-sell letters, in which more emphasis is put on positive motivations, encouragement and benefits, are more effective for drivers older than 45. As such, it is recommended that the content of the letters be customized based on the driver's age.

In addition, in view of the analysis results, it is important that high-risk drivers, such as drivers with multiple convictions and younger drivers, receive advisory letters soon after completing DIP to remind them to drive more safely. High-risk drivers should also receive a letter after the probation period and warning letters of future sanctions, like license suspension, upon receiving subsequent convictions (similar to Oregon's DIP).

Finally, it was found that a large number of drivers who were suspended continued to drive. Measures should be considered for reducing driving while suspended offenses. Vehicle control measures and California's impoundment program have been found effective in reducing recidivism in terms of subsequent convictions. However, the effectiveness of such measures and programs on crashes has been inconclusive.

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APPENDIX A. IOWA CODE

321.210 SUSPENSION.

1. The department is authorized to establish rules providing for the suspension of the license of an operator upon thirty days' notice and without preliminary hearing upon a showing by its records or other sufficient evidence that the licensee:

a. Is an habitually reckless or negligent driver of a motor vehicle.

b. Is an habitual violator of the traffic laws.

c. Is physically or mentally incapable of safely operating a motor vehicle.

d. Has permitted an unlawful or fraudulent use of the license.

e. Has committed an offense or acted in a manner in another state or foreign jurisdiction which in this state would be grounds for suspension or revocation.

f. Has committed a serious violation of the motor vehicle laws of this state.

g. Is subject to a license suspension under section 321.513.

Prior to a suspension taking effect under paragraph *"a"*, *"b"*, *"c"*, *"d"*, *"e"*, or *"f"*, the licensee shall have received thirty days' advance notice of the effective date of the suspension. Notwithstanding the terms of the Iowa administrative procedure Act, chapter 17A, the filing of a petition for judicial review shall, except for suspensions under paragraph *"c"*, operate to stay the suspension pending the determination by the district court.

2. In determining suspension the department shall not consider the following:

a. Violation of motor vehicle equipment standards if repairs are made within seventy-two hours of the violation and satisfactory evidence of repair is immediately sent to the department.

b. Violations of requirements to install and use safety belts, safety harnesses, and child restraint devices under sections 321.445 and 321.446.

c. Parking violations, meaning violation of a local authority parking ordinance or violation of sections 321L.4, 321.366, subsection 6, and 321.354 through 321.361 except section 321.354, subsection 1.

d. The first two speeding violations within any twelve- month period of ten miles per hour or less over the legal speed limit in speed zones having a legal speed limit between thirty-four miles per hour and fifty-six miles per hour.

Section History: Early Form

[C31, 35, § 4960-d35; C39, § **5014.10;** C46, 50, 54, 58, 62, 66, 71, 73, 75, 77, 79, 81, § 321.210; 82 Acts, ch 1100, § 18, 19]

Section History: Recent Form

84 Acts, ch 1016, § 2; 84 Acts, ch 1022, § 1; 86 Acts, ch 1009, §

1; 86 Acts, ch 1220, § 32; 87 Acts, ch 120, §1; 87 Acts, ch 167, §6; 89 Acts, ch 247, §6; 90 Acts, ch 1230, § 54; 96 Acts, ch 1152, § 15; 97 Acts, ch 23, § 33; 97 Acts, ch 104, §16

Referred to in § 321.12, 321.178, 321.180A, 321.189, 321.190, 321.191, 321.194, 321.210C, 321.212, 321.213, 321.215, 321.218, 321.555, 321A.17

Iowa Code Section 321.555

321.555 HABITUAL OFFENDER DEFINED.

As used in this division, *"habitual offender"* means any person who has accumulated convictions for separate and distinct offenses described in subsection 1, 2, or 3, committed after July 1, 1974, for which final convictions have been rendered, as follows:

1. Three or more of the following offenses, either singularly or in combination, within a six-year period:

a. Manslaughter resulting from the operation of a motor vehicle.

b. Operating a motor vehicle in violation of section 321J.2 or its predecessor statute.

c. Driving a motor vehicle while the person's driver's license is suspended, denied, revoked, or barred.

d. Perjury or the making of a false affidavit or statement under oath to the department of public safety.

e. An offense punishable as a felony under the motor vehicle laws of Iowa or any felony in the commission of which a motor vehicle is used.

f. Failure to stop and leave information or to render aid as required by sections 321.261 and 321.263.

g. Eluding or attempting to elude a pursuing law enforcement vehicle in violation of section 321.279.

h. Serious injury by a vehicle in violation of section 707.6A, subsection 4.

2. Six or more of any separate and distinct offenses within a two-year period in the operation of a motor vehicle, which are required to be reported to the department by section 321.491 or chapter 321C, except equipment violations, parking violations as defined in section 321.210, violations of registration laws, violations of sections 321.445 and 321.446, operating a vehicle with an expired license or permit, failure to appear, weights and measures violations and speeding violations of less than fifteen miles per hour over the legal speed limit.

3. The offenses included in subsections 1 and 2 shall be deemed to include offenses under any valid town, city or county ordinance paralleling and substantially conforming to the provisions of the Code concerning such offenses.

Section History: Early Form

[C75, 77, 79, 81, § 321.555; 82 Acts, ch 1167, § 10]

Section History: Recent Form

84 Acts, ch 1016, § 4; 84 Acts, ch 1022, § 9; 86 Acts, ch 1009, § 3; 86 Acts, ch 1220, § 37; 89 Acts, ch 296, § 36; 90 Acts, ch 1230, §

74--76; 93 Acts, ch 87, § 8; 97 Acts, ch 104, §24; 97 Acts, ch 177, § 2; 98 Acts, ch 1073, §9
Referred to in § 321.213, 321.215, 321.556, 321.560

Iowa Code Section 321.218 and 321A.32 Subsection 1

321.218 OPERATING WITHOUT VALID DRIVER'S LICENSE OR WHEN DISQUALIFIED -- PENALTIES.

1. A person whose driver's license or operating privilege has been denied, canceled, suspended, or revoked as provided in this chapter or as provided in section 252J.8 or section 901.5, subsection 10, and who operates a motor vehicle upon the highways of this state while the license or privilege is denied, canceled, suspended, or revoked, commits a simple misdemeanor. In addition to any other penalties, the punishment imposed for a violation of this subsection shall include assessment of a fine of not less than two hundred fifty dollars nor more than one thousand five hundred dollars.

2. The sentence imposed under this section shall not be suspended by the court, notwithstanding section 907.3 or any other statute.

3. The department, upon receiving the record of the conviction of a person under this section upon a charge of operating a motor vehicle while the license of the person is suspended or revoked, shall, except for licenses suspended under section 252J.8, 321.210, subsection 1, paragraph *"c"*, or section 321.210A or 321.513, extend the period of suspension or revocation for an additional like period, and the department shall not issue a new driver's license to the person during the additional period.

If the department receives a record of a conviction of a person under this section but the person's driving record does not indicate what the original grounds of suspension were, the period of suspension under this subsection shall be for a period not to exceed six months.

4. A person who operates a commercial motor vehicle upon the highways of this state when disqualified from operating the commercial motor vehicle under section 321.208 or the imminent hazard provisions of 49 C.F.R. § 383.52 commits a serious misdemeanor if a commercial driver's license is required for the person to operate the commercial motor vehicle.

5. The department, upon receiving the record of a conviction of a person under this section upon a charge of operating a commercial motor vehicle while the person is disqualified, shall extend the period of disqualification for an additional like period or for the time period specified in section 321.208, whichever is longer.

Section History: Early Form

[C31, 35, § 4960-d34, -d51; C39, § **5015.03;** C46, 50, 54, 58, 62, 66, 71, 73, 75, 77, 79, 81, § 321.218; 82 Acts, ch 1167, § 4]

Section History: Recent Form

84 Acts, ch 1142, § 1; 85 Acts, ch 195, § 36; 86 Acts, ch 1220, § 34; 89 Acts, ch 83, §43; 90 Acts, ch 1230, § 60; 93 Acts, ch 164, § 4; 95 Acts, ch 48, §4; 96 Acts, ch 1090, § 6, 7; 97 Acts, ch 104, §17; 98 Acts, ch 1073, § 9; 99 Acts, ch 153, §2; 2005 Acts, ch 8,

§28; 2006 Acts, ch 1030, §36
Referred to in § 321.211A, 321J.4B, 805.6

321A.32 OTHER VIOLATIONS -- PENALTIES.

1. Any person whose license or registration or nonresident's operating privilege has been suspended, denied, or revoked under this chapter or continues to remain suspended or revoked under this chapter, and who, during such suspension, denial, or revocation, or during such continuing suspension or continuing revocation, drives any motor vehicle upon any highway or knowingly permits any motor vehicle owned by such person to be operated by another upon any highway, except as permitted under this chapter, shall be guilty of a simple misdemeanor. In addition to any other penalties, the punishment imposed for a violation of this subsection shall include assessment of a fine of not less than two hundred fifty dollars nor more than one thousand five hundred dollars.

2. Any person willfully failing to return license or registration as required in section 321A.31 shall be guilty of a simple misdemeanor.

3. A person who forges or, without authority, signs a notice provided for under section 321A.5 that a policy or bond is in effect, or any evidence of financial responsibility, or any evidence of financial liability coverage as defined in section 321.1, or who files or offers for filing any such notice or evidence knowing or having reason to believe that it is forged or signed without authority, is guilty of a serious misdemeanor.

4. Any person who shall violate any provision of this chapter for which no penalty is otherwise provided shall be guilty of a serious misdemeanor.

Section History: Early Form

[C31, 35, § 5079-c7; C39, § **5021.05;** C46, § 321.279; C50, 54, 58, 62, 66, 71, 73, 75, 77, 79, 81, § 321A.32]

Section History: Recent Form

84 Acts, ch 1142, § 2; 97 Acts, ch 139, §10, 17, 18; 98 Acts, ch 1121, §8; 99 Acts, ch 153, §5
Referred to in § 321J.4B, 805.6

Iowa Code Chapter 321J.2

321J.2 OPERATING WHILE UNDER THE INFLUENCE OF ALCOHOL OR A DRUG OR WHILE HAVING AN ALCOHOL CONCENTRATION OF .08 OR MORE (OWI).

1. A person commits the offense of operating while intoxicated if the person operates a motor vehicle in this state in any of the following conditions:

a. While under the influence of an alcoholic beverage or other drug or a combination of such substances.

b. While having an alcohol concentration of .08 or more.

c. While any amount of a controlled substance is present in the person, as measured in the person's blood or urine.

2. A person who violates subsection 1 commits:

a. A serious misdemeanor for the first offense, punishable by all of the following:

(1) Imprisonment in the county jail for not less than forty-eight hours, to be served as ordered by the court, less credit for any time the person was confined in a jail or detention facility following arrest or for any time the person spent in a court-ordered operating-while-intoxicated program that provides law enforcement security. However, the court, in ordering service of the sentence and in its discretion, may accommodate the defendant's work schedule.

(2) Assessment of a fine of one thousand two hundred fifty dollars. However, in the discretion of the court, if no personal or property injury has resulted from the defendant's actions, the court may waive up to six hundred twenty-five dollars of the fine when the defendant presents to the court at the end of the minimum period of ineligibility, a temporary restricted license issued pursuant to section 321J.20. As an alternative to a portion or all of the fine, the court may order the person to perform unpaid community service.

(3) Revocation of the person's driver's license pursuant to section 321J.4, subsection 1, section 321J.9, or section 321J.12, subsection 2, which includes a minimum revocation period of one hundred eighty days, and may involve a revocation period of one year. A revocation under section 321J.9 includes a minimum period of ineligibility for a temporary restricted license of ninety days.

(a) A defendant whose alcohol concentration is .08 or more but not more than .10 shall not be eligible for any temporary restricted license for at least thirty days if a test was obtained and an accident resulting in personal injury or property damage occurred. The defendant shall be ordered to install an ignition interlock device of a type approved by the commissioner of public safety on all vehicles owned or operated by the defendant if the defendant seeks a temporary restricted license. There shall be no such period of ineligibility if no such accident occurred, and the defendant shall not be ordered to install an ignition interlock device.

(b) A defendant whose alcohol concentration is more than .10 shall not be eligible for any temporary restricted license for at least thirty days if a test was obtained, and an accident resulting in personal injury or property damage occurred or the defendant's alcohol concentration exceeded .15. There shall be no such period of ineligibility if no such accident occurred and the defendant's alcohol concentration did not exceed .15. In either case, where a defendant's alcohol concentration is more than .10, the defendant shall be ordered to install an ignition interlock device of a type approved by the commissioner of public safety on all vehicles owned or operated by the defendant if the defendant seeks a temporary restricted license.

(4) Assignment to substance abuse evaluation and treatment, a course for drinking drivers, and, if available and appropriate, a reality education substance abuse prevention program pursuant to subsection 3.

b. An aggravated misdemeanor for a second offense, and shall be imprisoned in the county jail or community-based correctional facility not less than seven days, and assessed a fine of not less than one thousand eight hundred seventy-five dollars nor more than six thousand two hundred fifty dollars.

c. A class "D" felony for a third offense and each subsequent offense, and shall be committed to the custody of the director of the

department of corrections for an indeterminate term not to exceed five years, shall be confined for a mandatory minimum term of thirty days, and shall be assessed a fine of not less than three thousand one hundred twenty-five dollars nor more than nine thousand three hundred seventy-five dollars.

(1) If the court does not suspend a person's sentence of commitment to the custody of the director of the department of corrections under this paragraph *"c"*, the person shall be assigned to a facility pursuant to section 904.513.

(2) If the court suspends a person's sentence of commitment to the custody of the director of the department of corrections under this paragraph *"c"*, the court shall order the person to serve not less than thirty days nor more than one year in the county jail, and the person may be committed to treatment in the community under section 907.6.

3. *a.* Notwithstanding the provisions of sections 901.5 and 907.3, the court shall not defer judgment or sentencing, or suspend execution of any mandatory minimum sentence of incarceration applicable to the defendant under subsection 2, and shall not suspend execution of any other part of a sentence not involving incarceration imposed pursuant to subsection 2, if any of the following apply:

(1) If the defendant's alcohol concentration established by the results of an analysis of a specimen of the defendant's blood, breath, or urine withdrawn in accordance with this chapter exceeds .15, regardless of whether or not the alcohol concentration indicated by the chemical test minus the established margin of error inherent in the device or method used to conduct the test equals an alcohol concentration of .15 or more.

(2) If the defendant has previously been convicted of a violation of subsection 1 or a statute in another state substantially corresponding to subsection 1.

(3) If the defendant has previously received a deferred judgment or sentence for a violation of subsection 1 or for a violation of a statute in another state substantially corresponding to subsection 1.

(4) If the defendant refused to consent to testing requested in accordance with section 321J.6.

(5) If the offense under this chapter results in bodily injury to a person other than the defendant.

b. All persons convicted of an offense under subsection 2 shall be ordered, at the person's expense, to undergo, prior to sentencing, a substance abuse evaluation.

c. Where the program is available and is appropriate for the convicted person, a person convicted of an offense under subsection 2 shall be ordered to participate in a reality education substance abuse prevention program as provided in section 321J.24.

d. A minimum term of imprisonment in a county jail or community-based correctional facility imposed on a person convicted of a second or subsequent offense under subsection 2 shall be served on consecutive days. However, if the sentencing court finds that service of the full minimum term on consecutive days would work an undue hardship on the person, or finds that sufficient jail space is not available and is not reasonably expected to become available within four months after sentencing to incarcerate the person serving the minimum sentence on consecutive days, the court may order the person to serve the minimum term in segments of at least forty-eight hours and to perform a specified number of hours of unpaid community service as deemed appropriate by the sentencing court.

4. In determining if a violation charged is a second or subsequent offense for purposes of criminal sentencing or license revocation under this chapter:

a. Any conviction or revocation deleted from motor vehicle operating records pursuant to section 321.12 shall not be considered as a previous offense.

b. Deferred judgments entered pursuant to section 907.3 for violations of this section shall be counted as previous offenses.

c. Convictions or the equivalent of deferred judgments for violations in any other states under statutes substantially corresponding to this section shall be counted as previous offenses. The courts shall judicially notice the statutes of other states which define offenses substantially equivalent to the one defined in this section and can therefore be considered corresponding statutes. Each previous violation on which conviction or deferral of judgment was entered prior to the date of the violation charged shall be considered and counted as a separate previous offense.

5. A person shall not be convicted and sentenced for more than one violation of this section for actions arising out of the same event or occurrence, even if the event or occurrence involves more than one of the conditions specified in subsection 1.

6. The clerk of the district court shall immediately certify to the department a true copy of each order entered with respect to deferral of judgment, deferral of sentence, or pronouncement of judgment and sentence for a defendant under this section.

7. *a.* This section does not apply to a person operating a motor vehicle while under the influence of a drug if the substance was prescribed for the person and was taken under the prescription and in accordance with the directions of a medical practitioner as defined in chapter 155A or if the substance was dispensed by a pharmacist without a prescription pursuant to the rules of the board of pharmacy, if there is no evidence of the consumption of alcohol and the medical practitioner or pharmacist had not directed the person to refrain from operating a motor vehicle.

b. When charged with a violation of subsection 1, paragraph *"c"*, a person may assert, as an affirmative defense, that the controlled substance present in the person's blood or urine was prescribed or dispensed for the person and was taken in accordance with the directions of a practitioner and the labeling directions of the pharmacy, as that person and place of business are defined in section 155A.3.

8. In any prosecution under this section, evidence of the results of analysis of a specimen of the defendant's blood, breath, or urine is admissible upon proof of a proper foundation.

a. The alcohol concentration established by the results of an analysis of a specimen of the defendant's blood, breath, or urine withdrawn within two hours after the defendant was driving or in physical control of a motor vehicle is presumed to be the alcohol concentration at the time of driving or being in physical control of the motor vehicle.

b. The presence of a controlled substance or other drug established by the results of analysis of a specimen of the defendant's blood or urine withdrawn within two hours after the defendant was driving or in physical control of a motor vehicle is presumed to show the presence of such controlled substance or other drug in the defendant at the time of driving or being in physical control of the motor vehicle.

c. The department of public safety shall adopt nationally accepted standards for determining detectable levels of controlled substances in the division of criminal investigation's initial laboratory screening test for controlled substances.

9. *a.* In addition to any fine or penalty imposed under this chapter, the court shall order a defendant convicted of or receiving a deferred judgment for a violation of this section to make restitution for damages resulting directly from the violation, to the victim, pursuant to chapter 910. An amount paid pursuant to this restitution order shall be credited toward any adverse judgment in a subsequent civil proceeding arising from the same occurrence. However, other than establishing a credit, a restitution proceeding pursuant to this section shall not be given evidentiary or preclusive effect in a subsequent civil proceeding arising from the same occurrence.

b. The court may order restitution paid to any public agency for the costs of the emergency response resulting from the actions constituting a violation of this section, not exceeding five hundred dollars per public agency for each such response. For the purposes of this paragraph, *"emergency response"* means any incident requiring response by fire fighting, law enforcement, ambulance, medical, or other emergency services. A public agency seeking such restitution shall consult with the county attorney regarding the expenses incurred by the public agency, and the county attorney may include the expenses in the statement of pecuniary damages pursuant to section 910.3.

10. In any prosecution under this section, the results of a chemical test shall not be used to prove a violation of subsection 1, paragraph *"b"* or *"c"*, if the alcohol, controlled substance, or other drug concentration indicated by the chemical test minus the established margin of error inherent in the device or method used to conduct the chemical test does not equal or exceed the level prohibited by subsection 1, paragraph *"b"* or *"c"*.

Section History: Recent Form

86 Acts, ch 1220, § 2; 87 Acts, ch 118, § 4; 87 Acts, ch 215, § 46; 90 Acts, ch 1233, § 20; 90 Acts, ch 1251, § 33; 97 Acts, ch 177, §4, 5; 98 Acts, ch 1073, § 9; 98 Acts, ch 1100, §50; 98 Acts, ch 1138, § 2, 3, 11--13, 37; 99 Acts, ch 96, §36; 2000 Acts, ch 1118, §1; 2000 Acts, ch 1135, §1; 2002 Acts, ch 1042, §1; 2003 Acts, ch 60, §1, 2; 2003 Acts, ch 179, §120; 2003 Acts, 1st Ex, ch 2, §48, 209; 2006 Acts, ch 1010, § 90; 2006 Acts, ch 1166, § 1--3; 2007 Acts, ch 10, §174

Referred to in § 232.22, 321.12, 321.213, 321.279, 321.555, 321J.2A, 321J.2B, 321J.3, 321J.4, 321J.4B, 321J.5, 321J.6, 321J.8, 321J.9, 321J.10, 321J.10A, 321J.12, 321J.13, 321J.15, 321J.16, 321J.17, 321J.20, 321J.22, 321J.24, 321J.25, 602.8102(51), 707.6A, 804.31, 902.3, 907.3, 910.1, 910.2, 910.3, 915.80

For provisions relating to third offense OWI driver's license revocations and restoration of driving privileges, see 99 Acts, ch 153, §25

Iowa Code 321.263

321.263 INFORMATION AND AID -- LEAVING SCENE OF ACCIDENT.

1. The driver of a vehicle involved in an accident resulting in injury to or death of a person or damage to a vehicle which is driven or attended by a person shall give the driver's name, address, and the registration number of the vehicle the driver is driving and shall upon request and if available exhibit the driver's driver's license to the person struck, the driver or occupant of, or the person attending the vehicle involved in the accident and shall render to a person injured in the accident reasonable assistance, including the transporting or arranging for the transporting of the person for medical treatment if it is apparent that medical treatment is necessary or if transportation for medical treatment is requested by the injured person.

2. If the accident causes the death of a person, all surviving drivers shall remain at the scene of the accident except to seek necessary aid or to report the accident to law enforcement authorities. Before leaving the scene of the fatal accident, each surviving driver shall leave the surviving driver's driver's license, automobile registration receipt, or other identification data at the scene of the accident. After leaving the scene of the accident, a surviving driver shall promptly report the accident to law enforcement authorities, and shall immediately return to the scene of the accident or inform the law enforcement authorities where the surviving driver can be located.

Section History: Early Form

[S13, § 1571-m23; C24, 27, 31, 35, § 5072, 5079; C39, § **5020.03;** C46, 50, 54, 58, 62, 66, 71, 73, 75, 77, 79, 81, § 321.263]

Section History: Recent Form

90 Acts, ch 1230, §68; 98 Acts, ch 1073, §9
Referred to in § 321.228, 321.261, 321.262, 321.555

APPENDIX B. DATA

Table B.1. DIP location

#	Abbreviation	Community College	City
1	NICC	Northeast Iowa Community College Calmar	CALMAR
2	NICC	Northeast Iowa Community College Peosta	PEOSTA
3	NIACC	North Iowa Area Community College	MASON CITY
4	ILCC	*Iowa Lakes Community College*	EMMETSBURG
5	NCC	Northwest Iowa Community College	SHELDON
6	ICCC	*Iowa Central Community College*	FORT DODGE
7	IVCCD	*Iowa Valley Community College District*	MARSHALLTOWN
8	HCC	*Hawkeye Community College*	WATERLOO
9	EICCD	Eastern Iowa Community College District	BETTENDORF
10	KCC	*Kirkwood Community College*	CEDAR RAPIDS
11	DMACC	*Des Moines Area Community College*	ANKENY
12	WITCC	Western Iowa Tech Community College Denison	DENISON
13	WITCC	Western Iowa Tech Community College Sioux City	SIOUX CITY
14	IWCC	*Iowa Western Community College*	COUNCIL BLUFFS
15	SWCC	Southwestern Community College	CRESTON
16	IHCC	*Indian Hills Community College*	OTTUMWA
17	SECC	*Southeastern Community College*	WEST BURLINGTON

Table B.2. Description of conviction reason codes

Reason Code	Description	Reason Code	Description
2	Allow unauthorized person to drive	42	Improper start
4	Careless driving	43	Improper turn
6	Crossing fire hose	47	Injurious material on highway
9	Drag Racing	49	Interfere with signs or signals (321.260)
10	Driving where prohibited	51	Lamps on parked vehicle (321.395)
13	Driving wrong way on one way street	60	No driver's license
14	Driving too slow	61	Obstructed vision
15	Driving without headlamps or with park lamps	65	False statement under oath
18	Fail to yield ½ of roadway	67	Reckless driving
23	Fail to obey officer	68	Passing school bus
24	Violation of accident requirements	71	Violation of motorcycle or moped
25	Fail to dim headlights	72	Speed
27	Fail to yield right of way	85	Operating without owner's consent
28	Fail to yield to emergency vehicle	91	Offense by owner (conviction)
29	Fail to obey traffic sign/signal	93	Following emergency vehicle

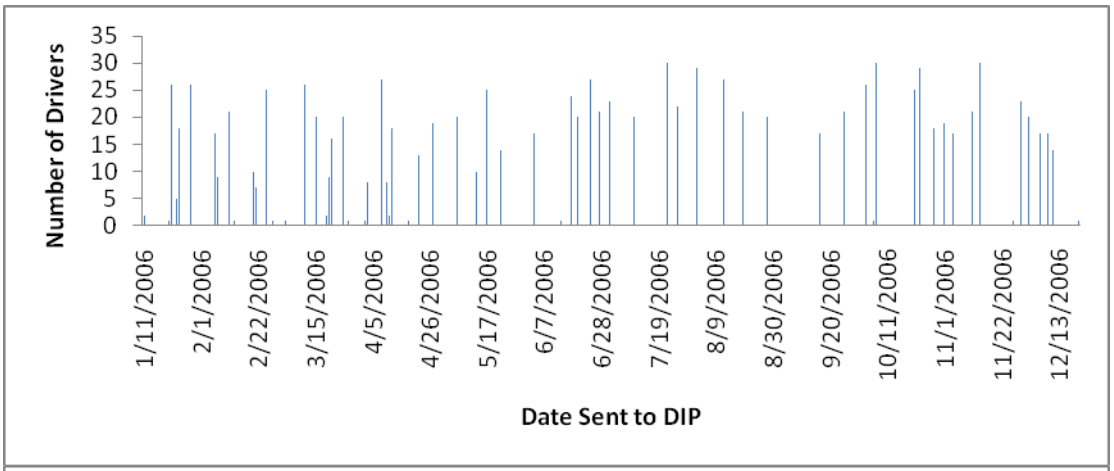
Table B.2 Description of conviction reason codes (continued)

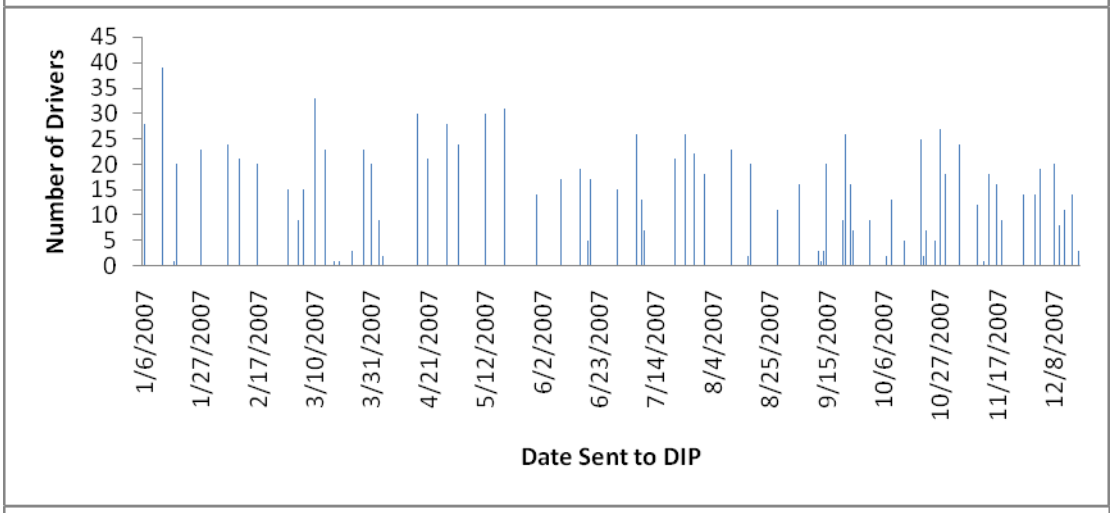
30	Following too close	96	Speed (10 mph & under 35-55 mph zone)
31	Fail to have vehicle under control	120	Open container
34	Improper backing	122	Violation of impoundment or immobilization (321J.4B)
35	Improper lane (changing lanes)	135	Leaving the scene of PD ACC (321.263)
40	Improper passing	136	Improper lane use
41	Improper signal or failed to signal	167	Violation resulting in fatal accident (in CMV)
*12	Driving while suspended, denied, cancelled, revoked	*108	Driving while barred (in CMV)
*17	Eluding	*109	Violating out-of-service order (CMV)
*21	Felony in use of motor vehicle	*110	Vehicular homicide or serious injury – OWI
*52	Larceny of motor vehicle	*111	Unlawful use of license – alcohol related
*54	Leaving scene of personal injury accident	*118	Possession alcohol under legal age
*56	Manslaughter	*138	GDL violation
*57	Vehicular homicide or serious injury	*143	Unlawful use of license – Tobacco
*62	Operating while intoxicated	*144	Fail to stop before crossing railroad
*63	Ignition interlock device	*145	Fail to slow/check RR crossing
*70	Deferred judgment OWI	*146	Fail to stop/RR track not clear
*81	Violation of restricted license	*147	Blocks RR crossing
*83	Violation of school license	*148	Disobeys traffic control at RR
*89	Violation of moped law	*149	Not enough clearance/RR
*102	Felony or aggravated misdemeanor involving disp/dist/mfg of drugs (CMV)	*150	Violation of RR crossing
*103	No commercial driver's license (321.174(3))	*153	Violation of RR crossing
*104	Driving while disqualified (in CMV)	*166	Theft of motor fuel

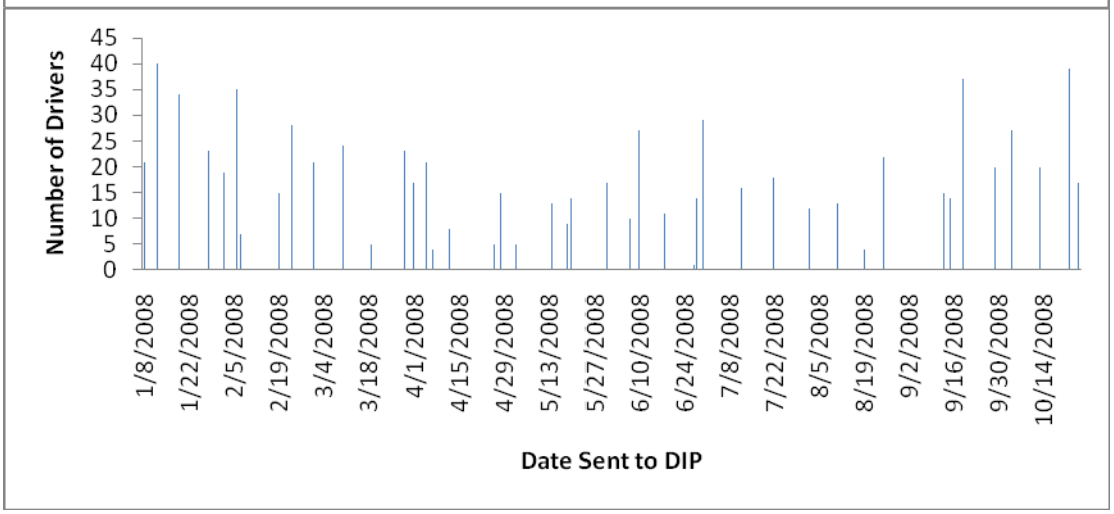
"*" Can be reason for conviction or sanction.

APPENDIX C. DISTRIBUTION OF DRIVER POPULATION BY DIP DATE AND DIP LOCATION

Des Moines Area Community College, Ankeny







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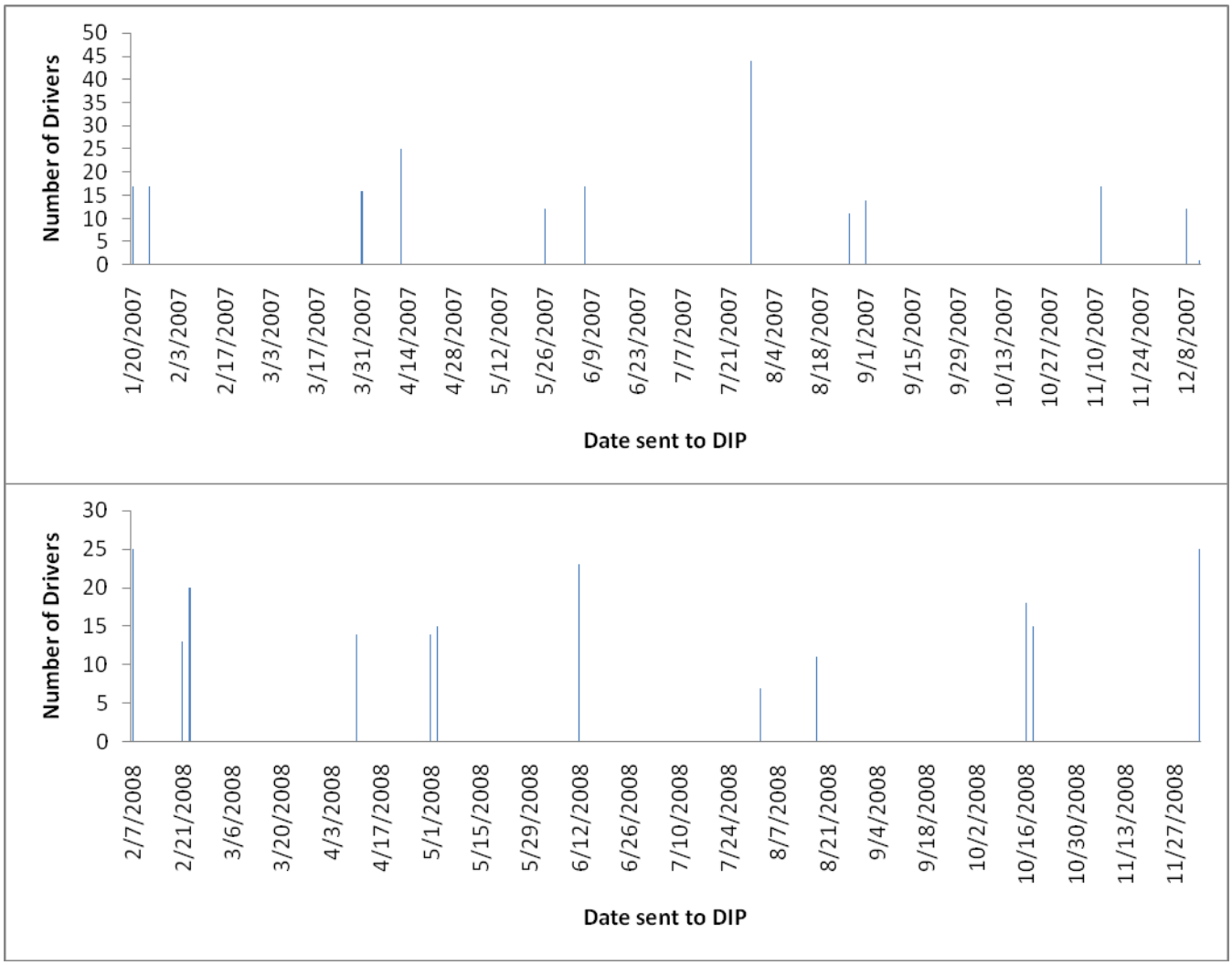

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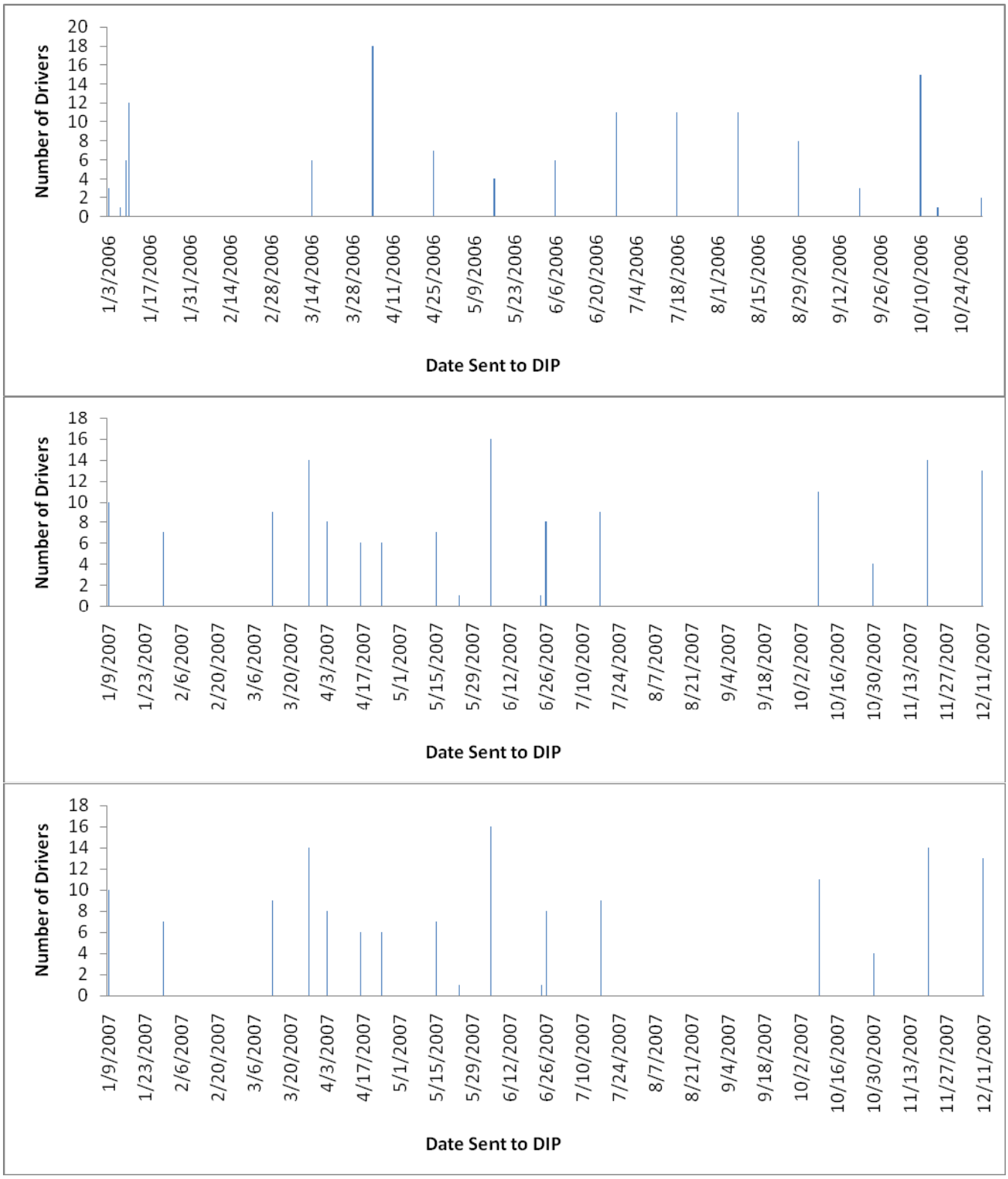

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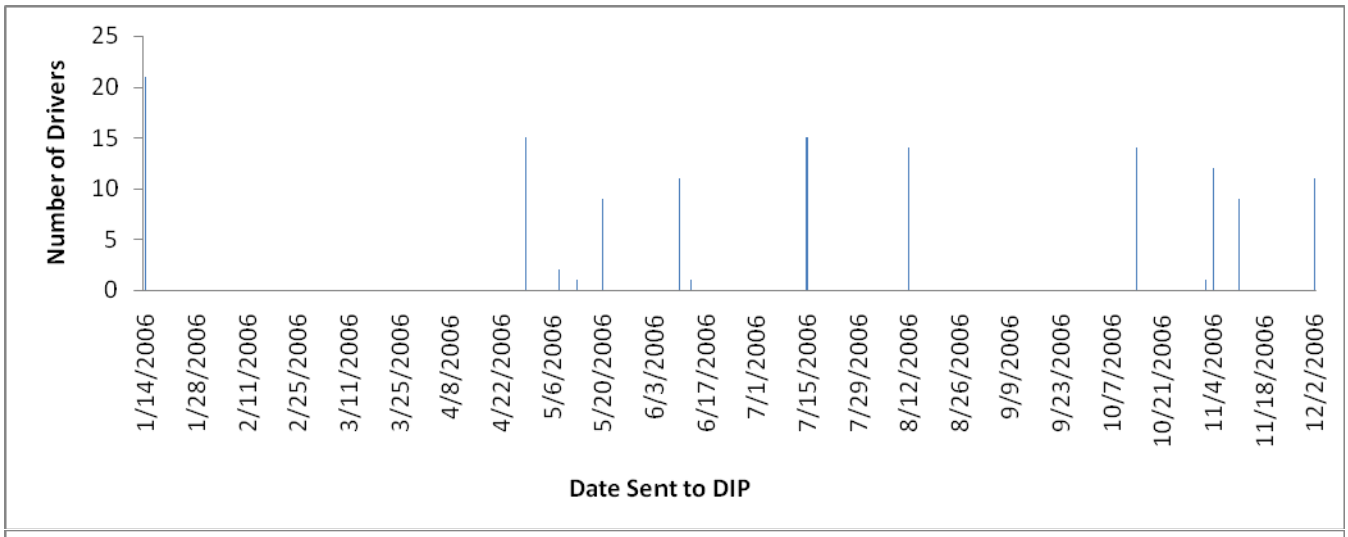
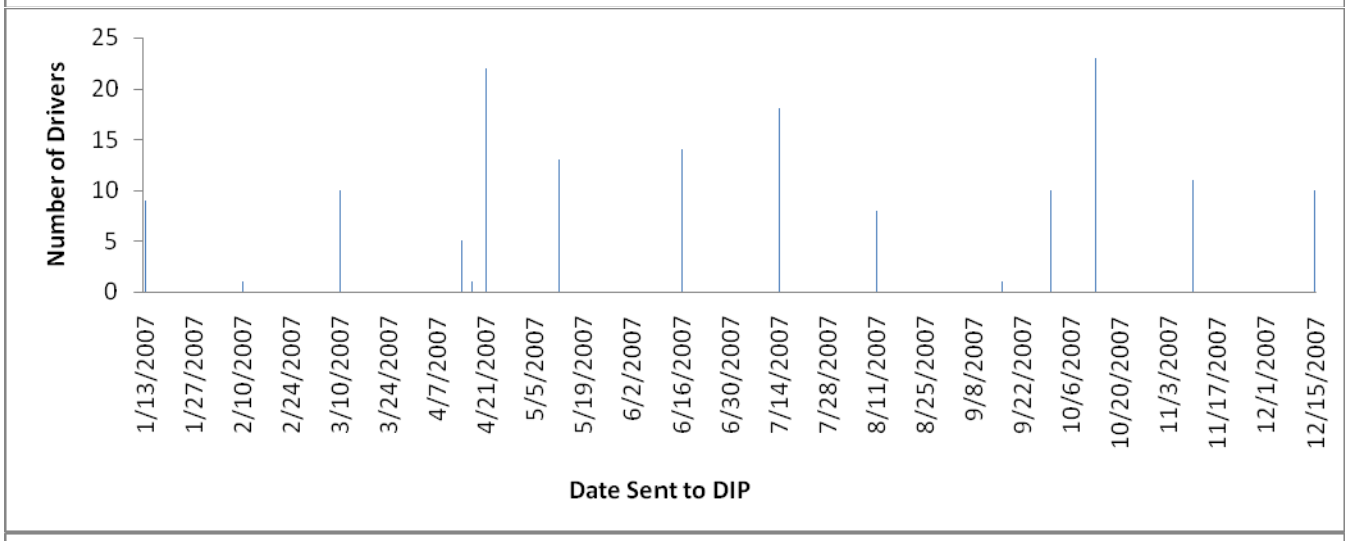
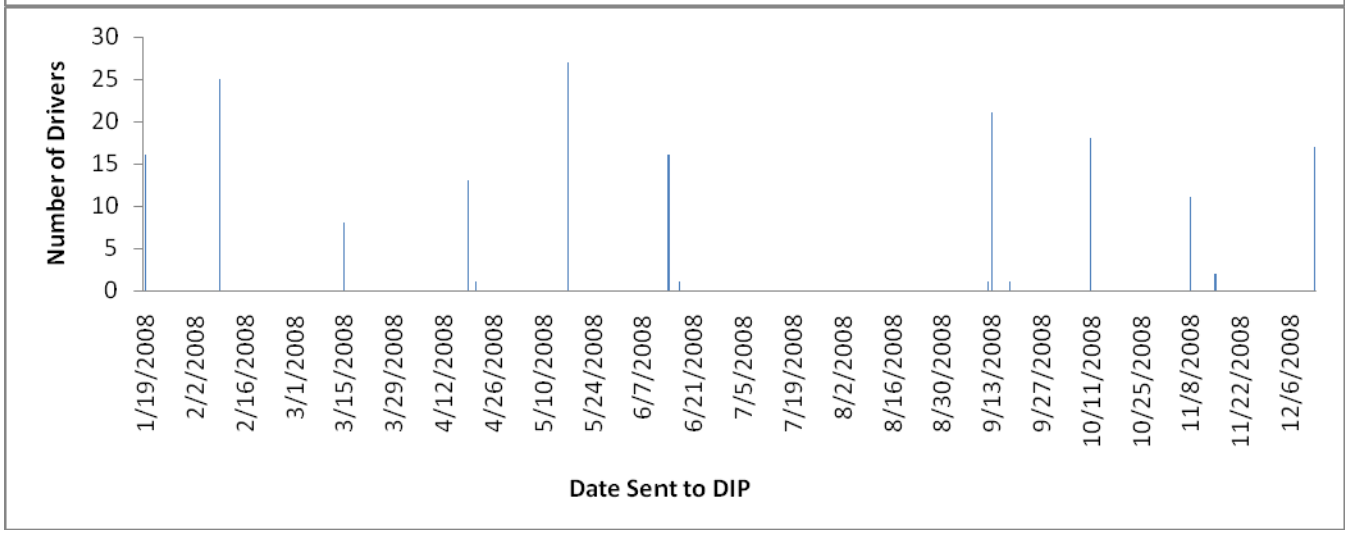
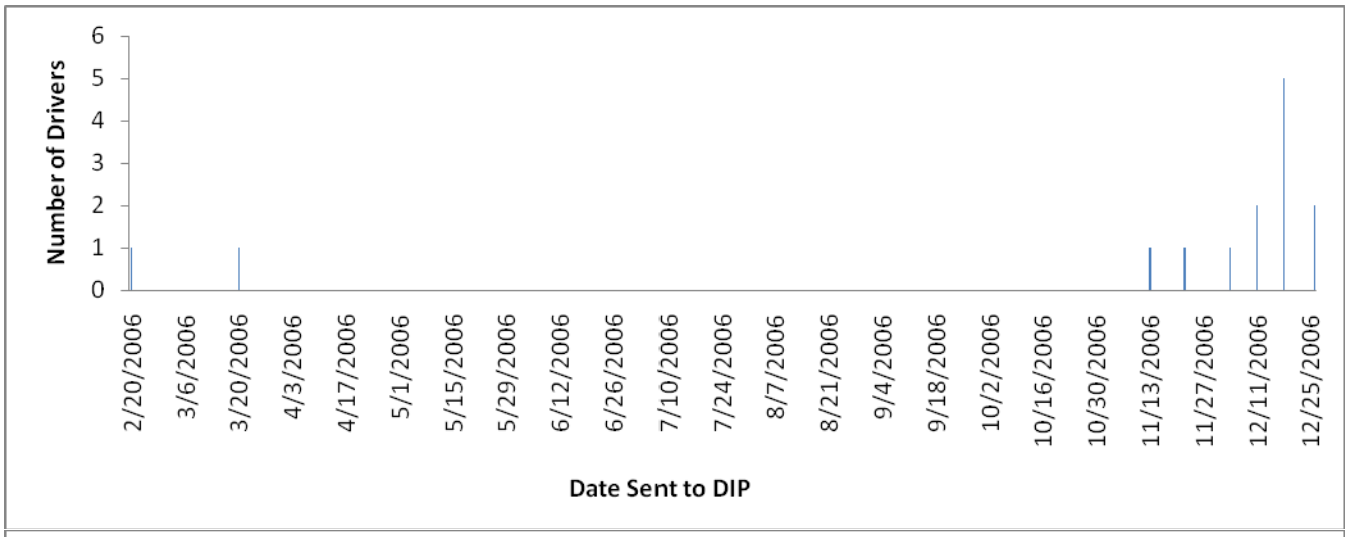
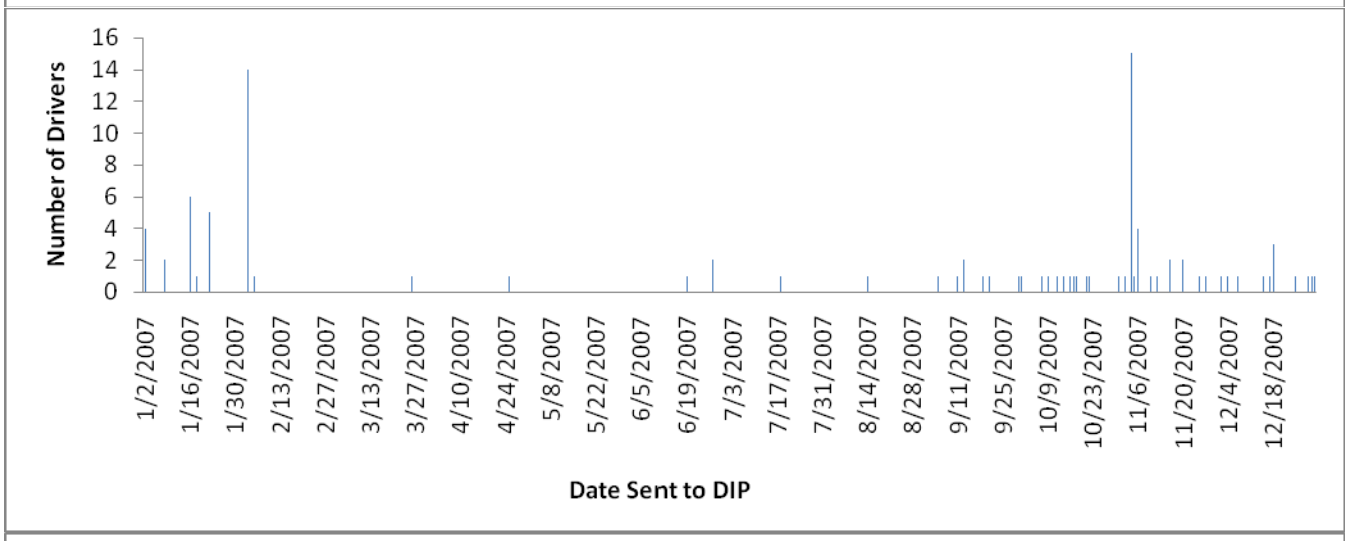


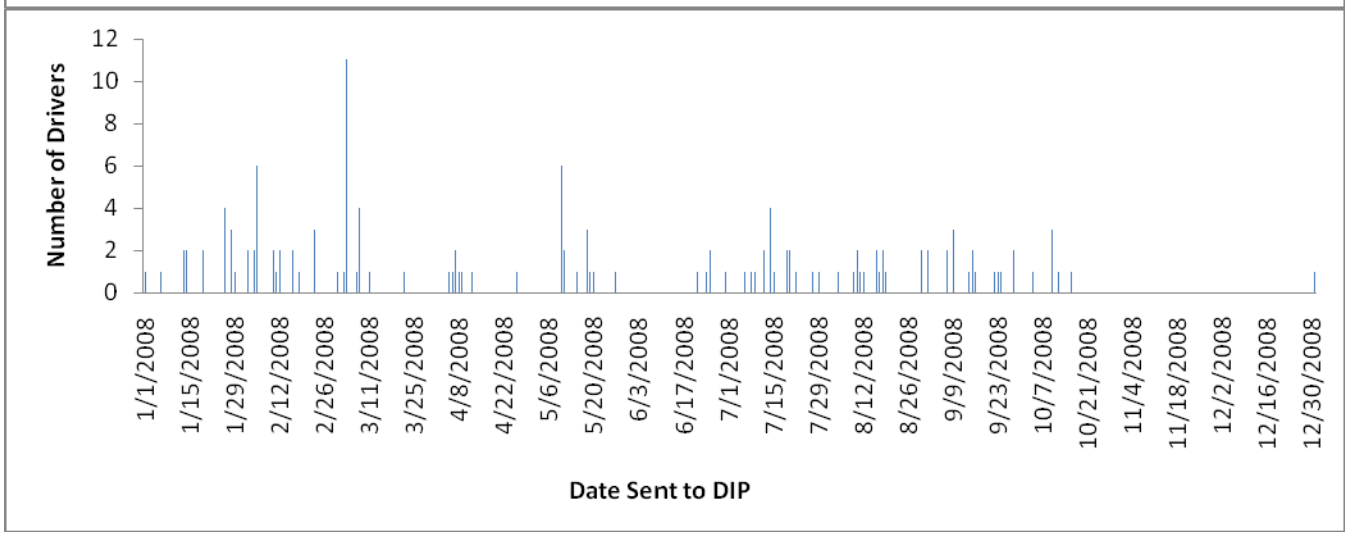




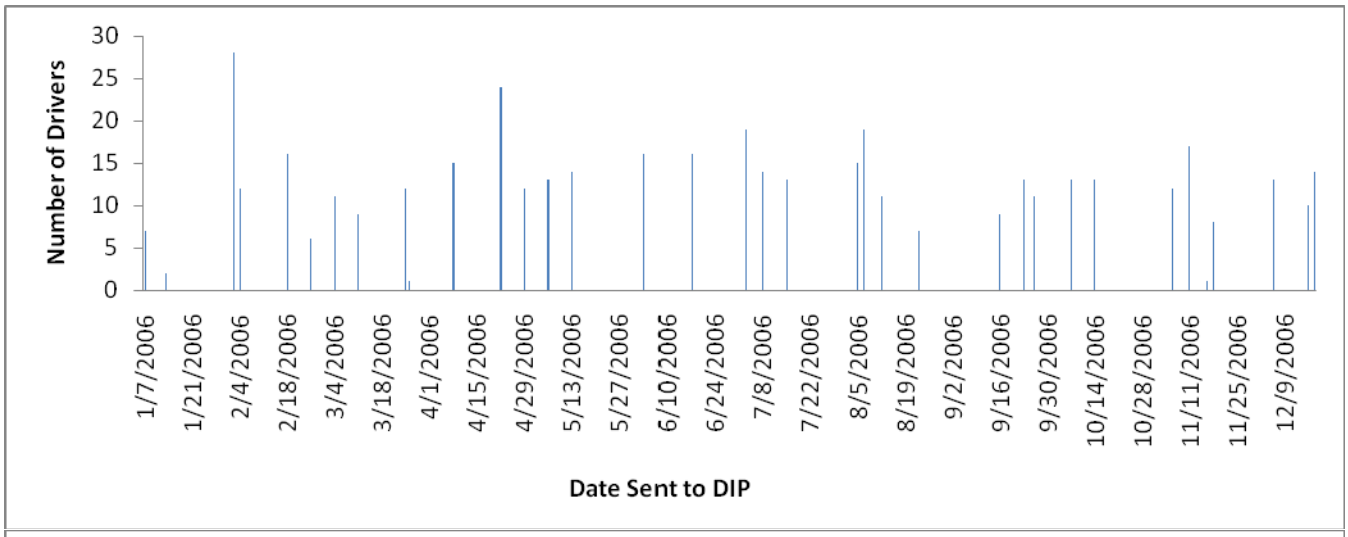
Hawkeye Community College, Waterloo

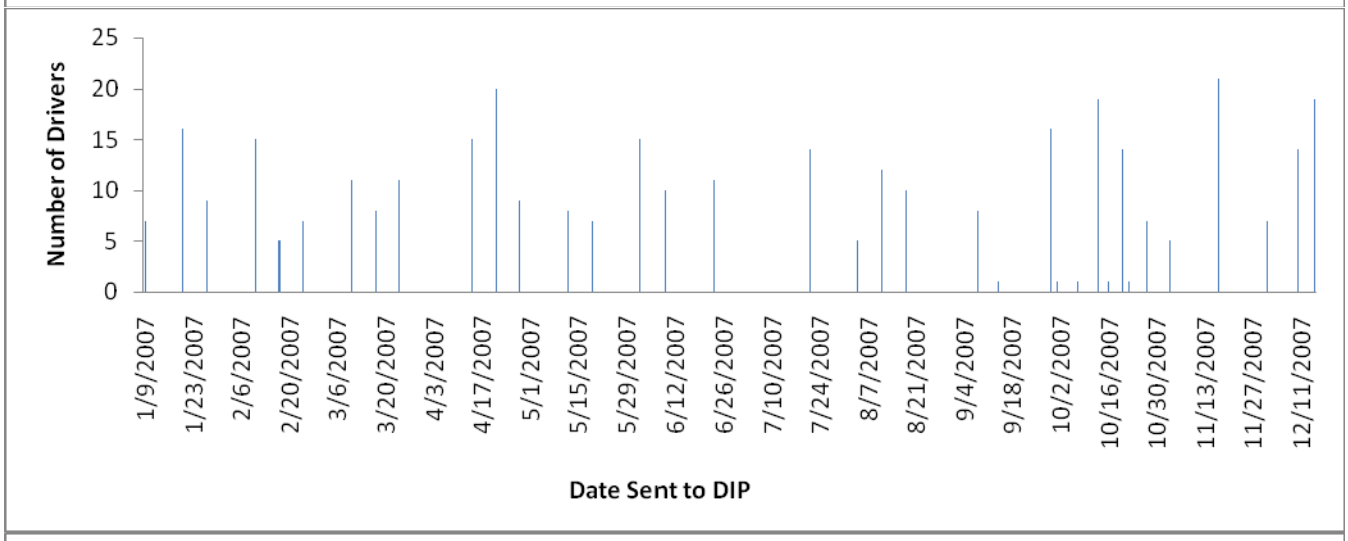


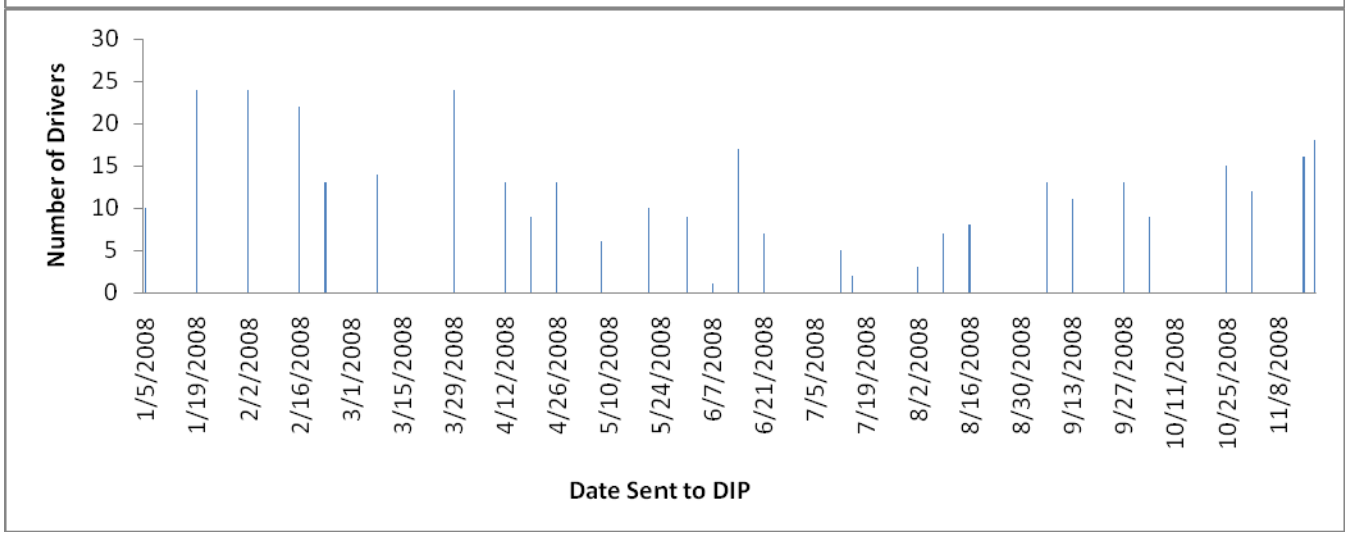




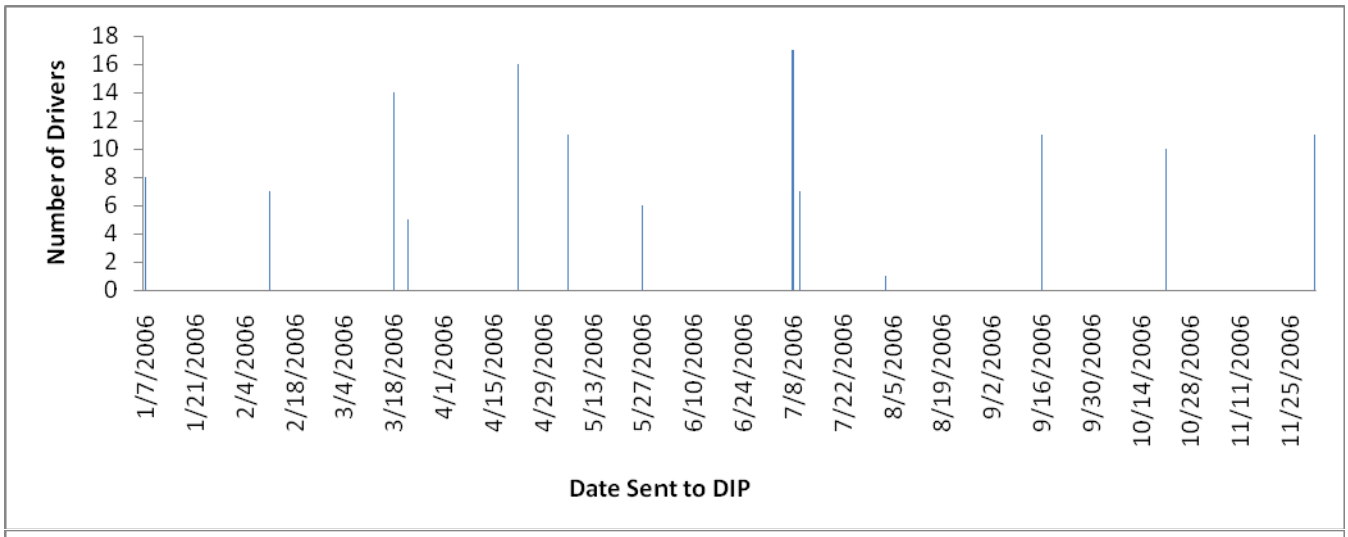
Eastern Iowa Community College District, Bettendorf

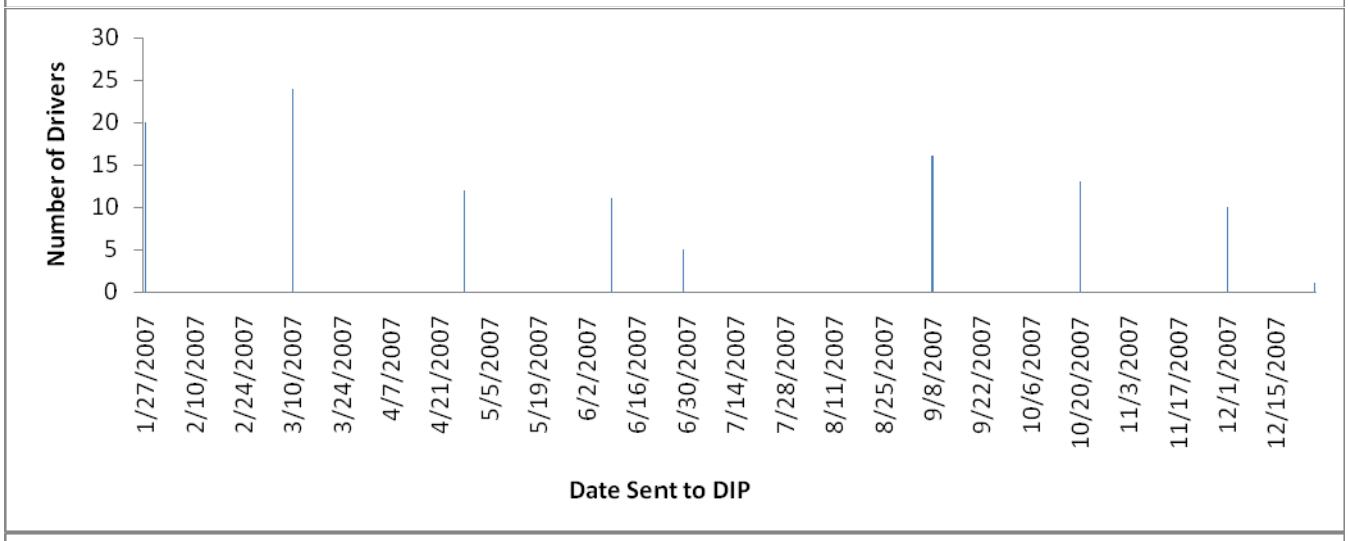


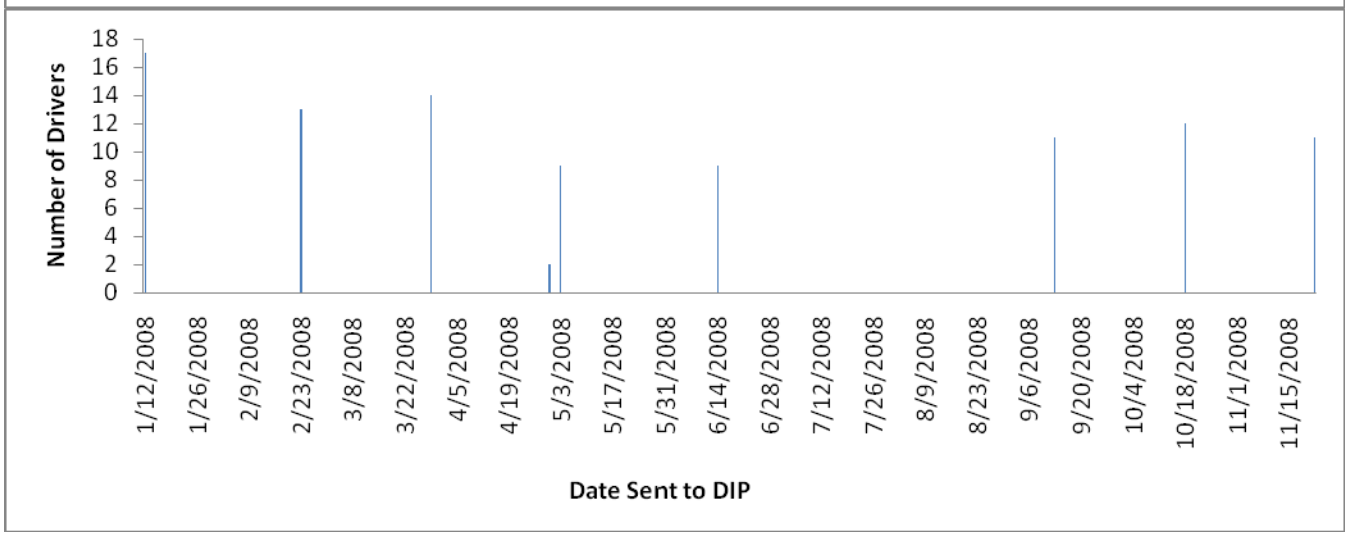




Iowa Central Community College, Fort Dodge







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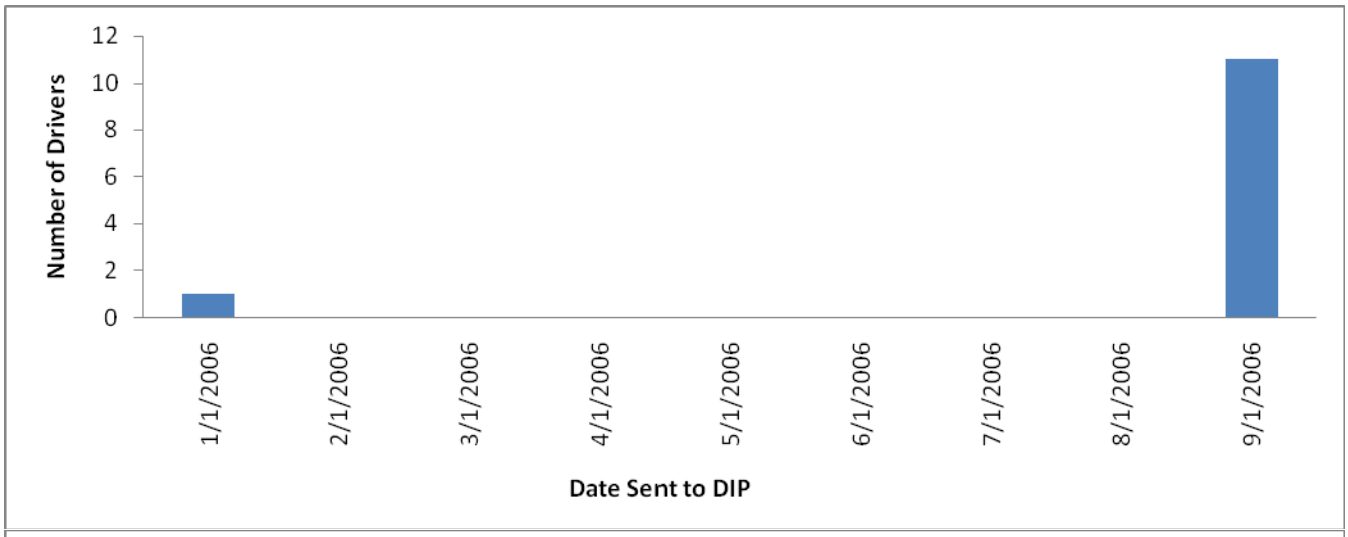

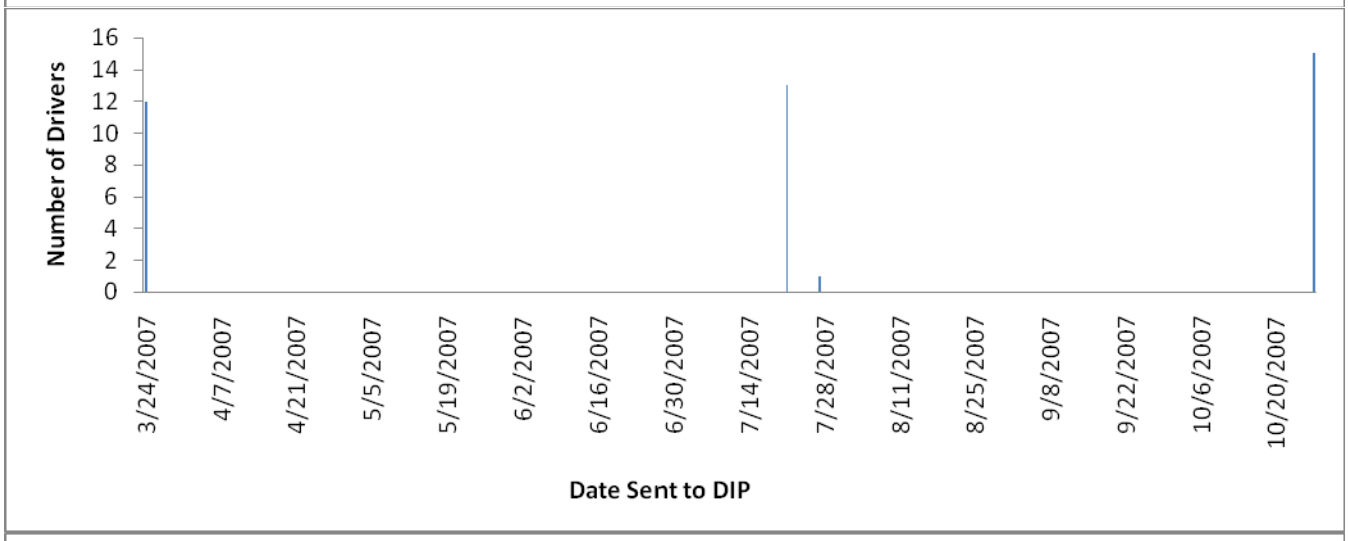

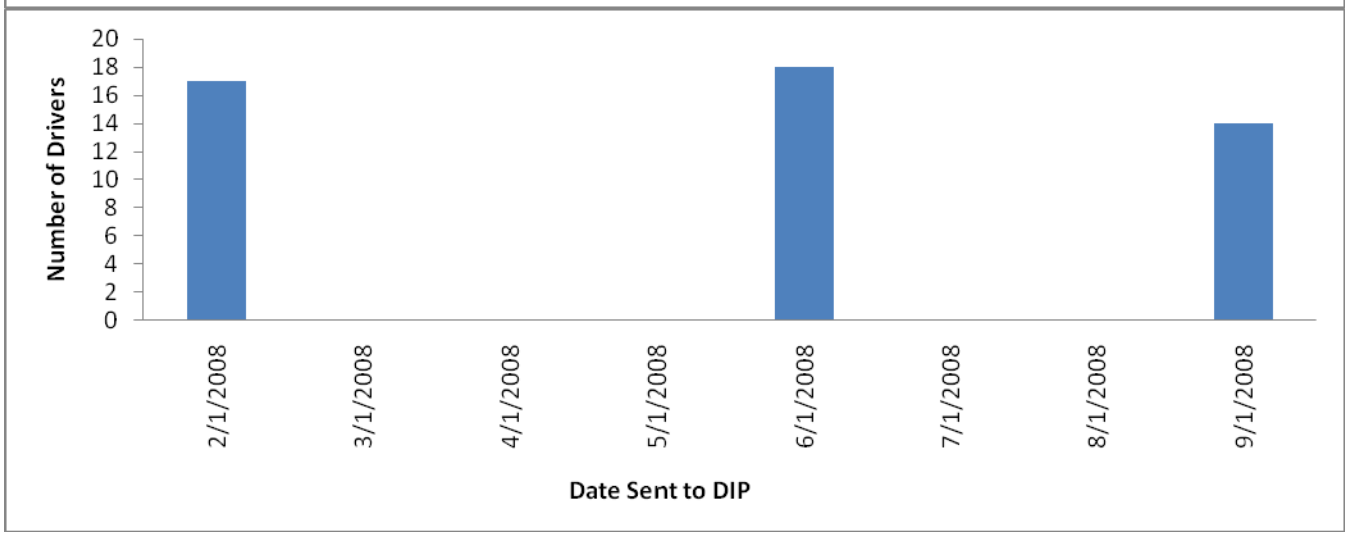

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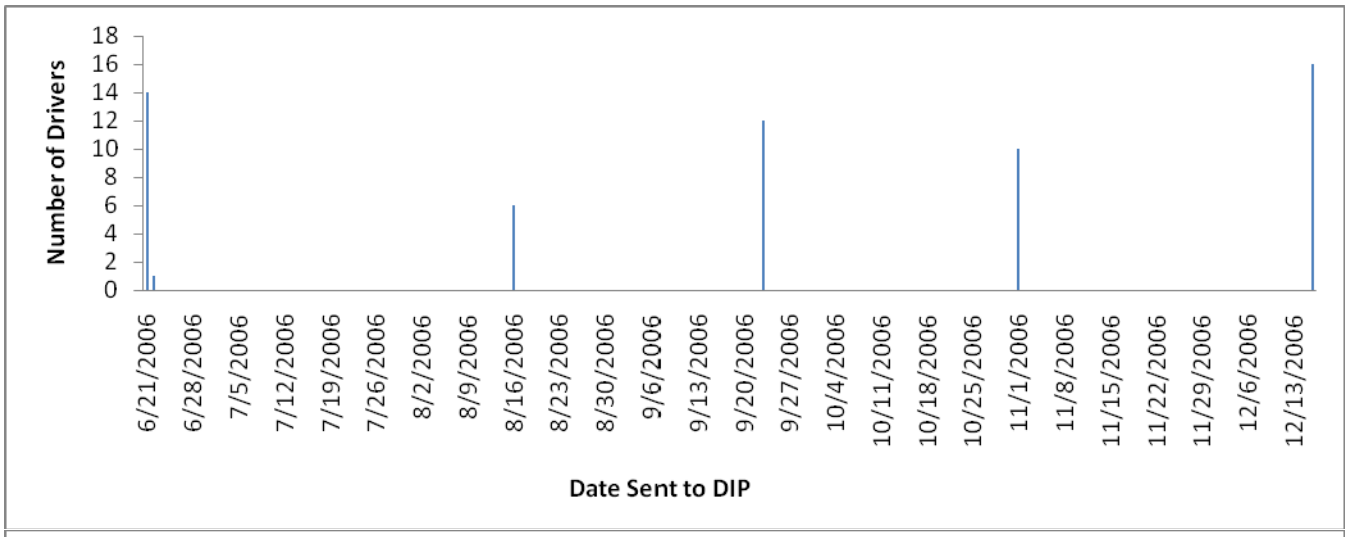
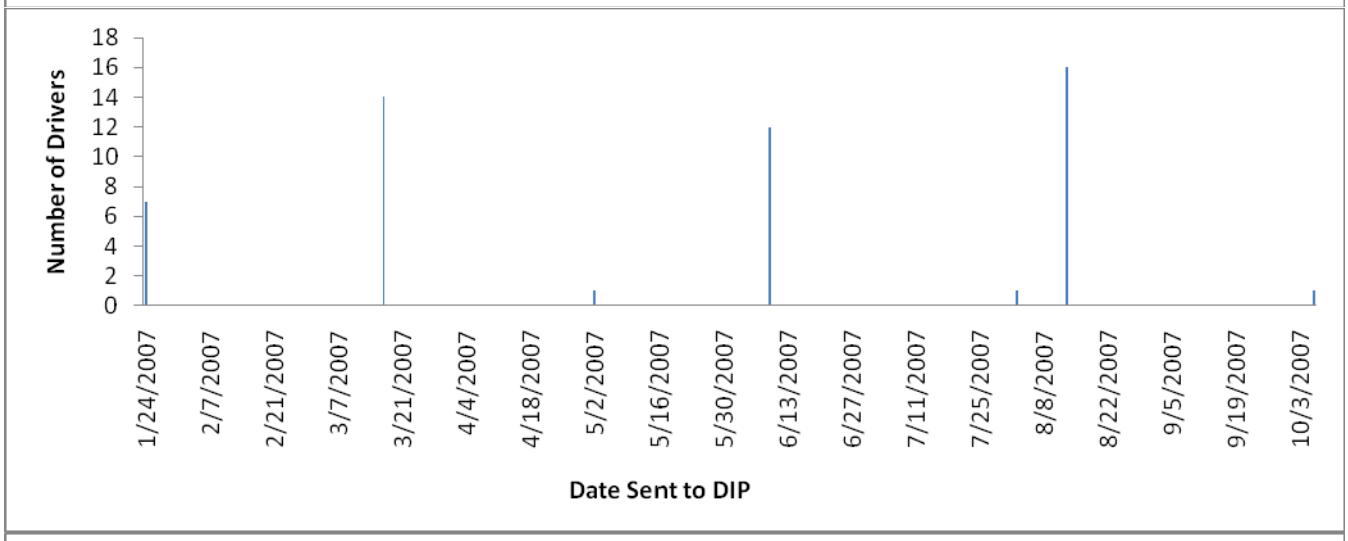
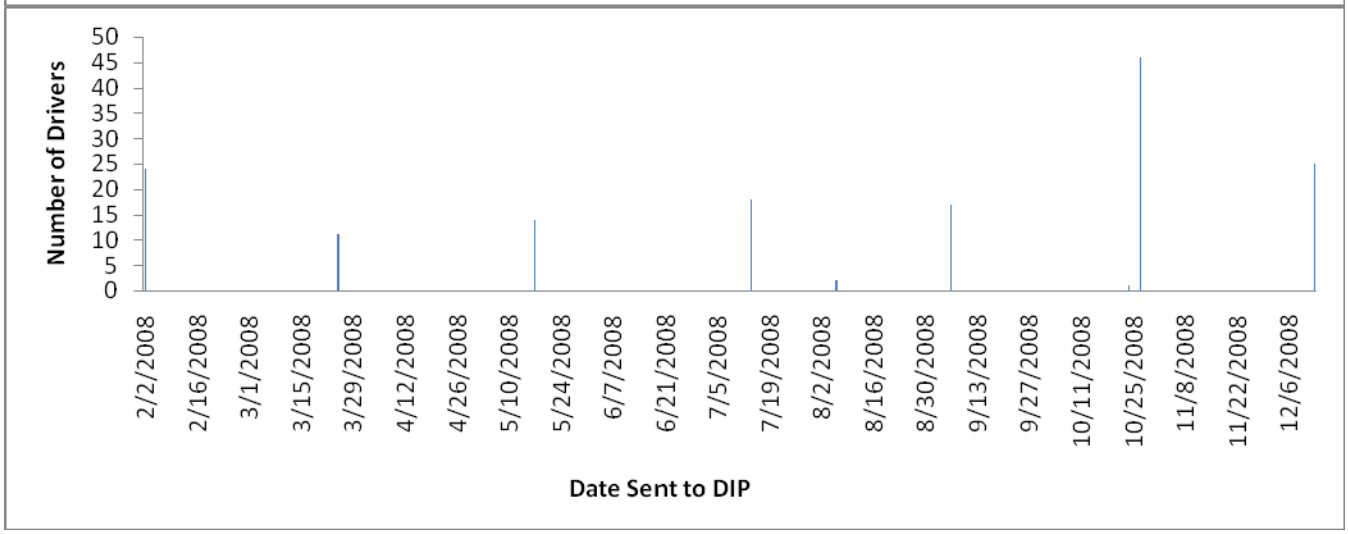
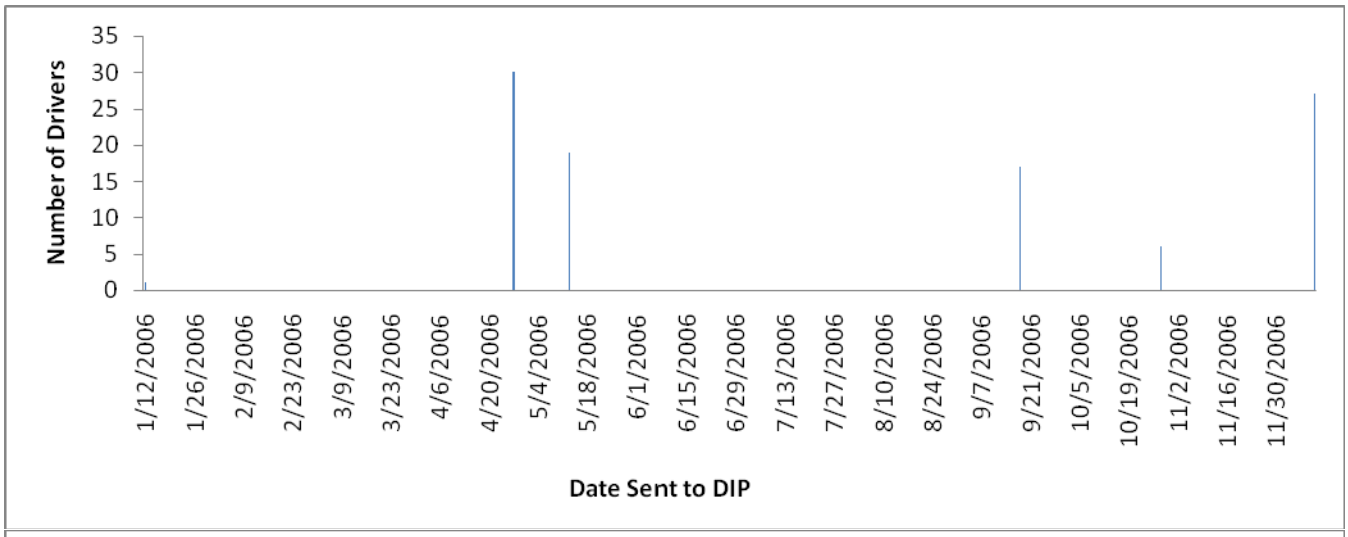
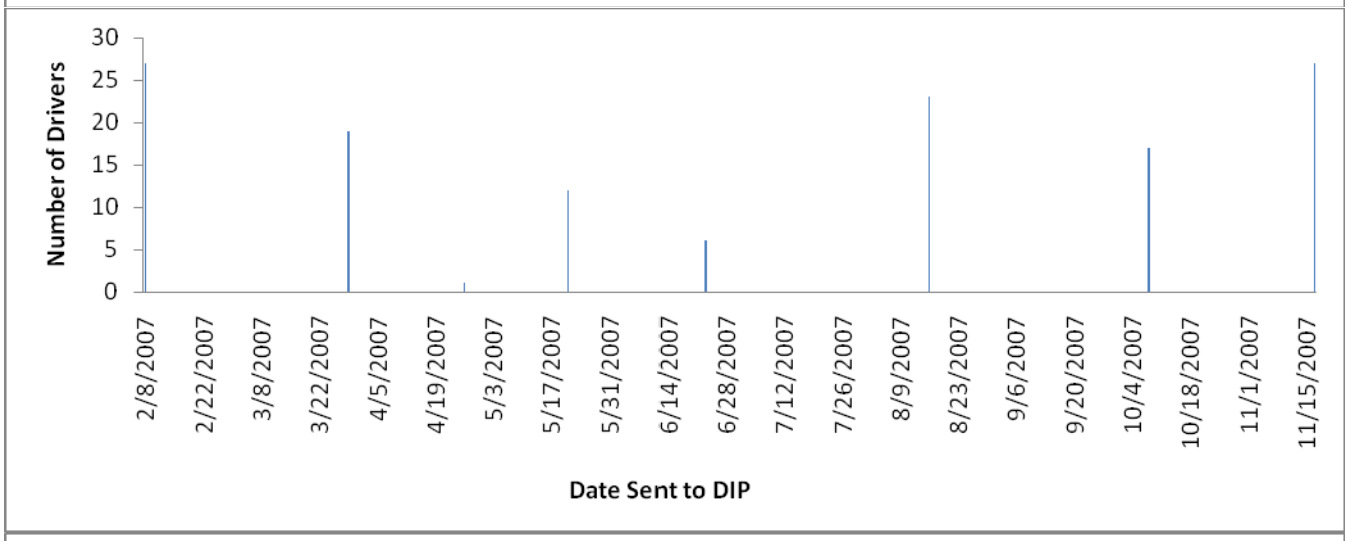


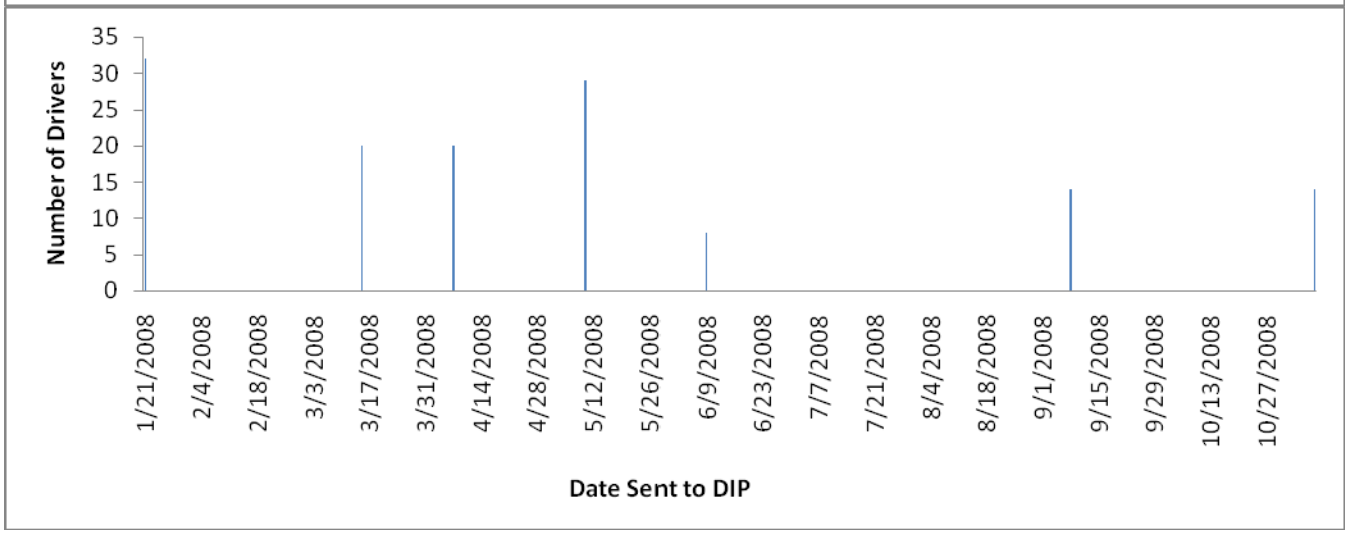




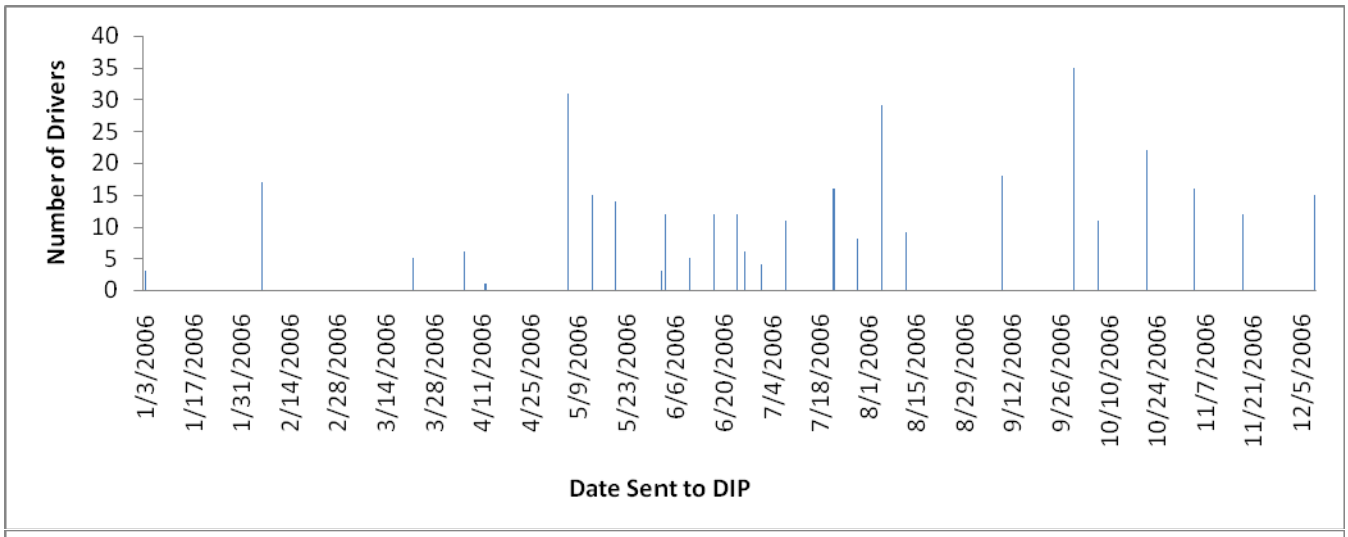
Iowa Western Community College, Council Bluffs

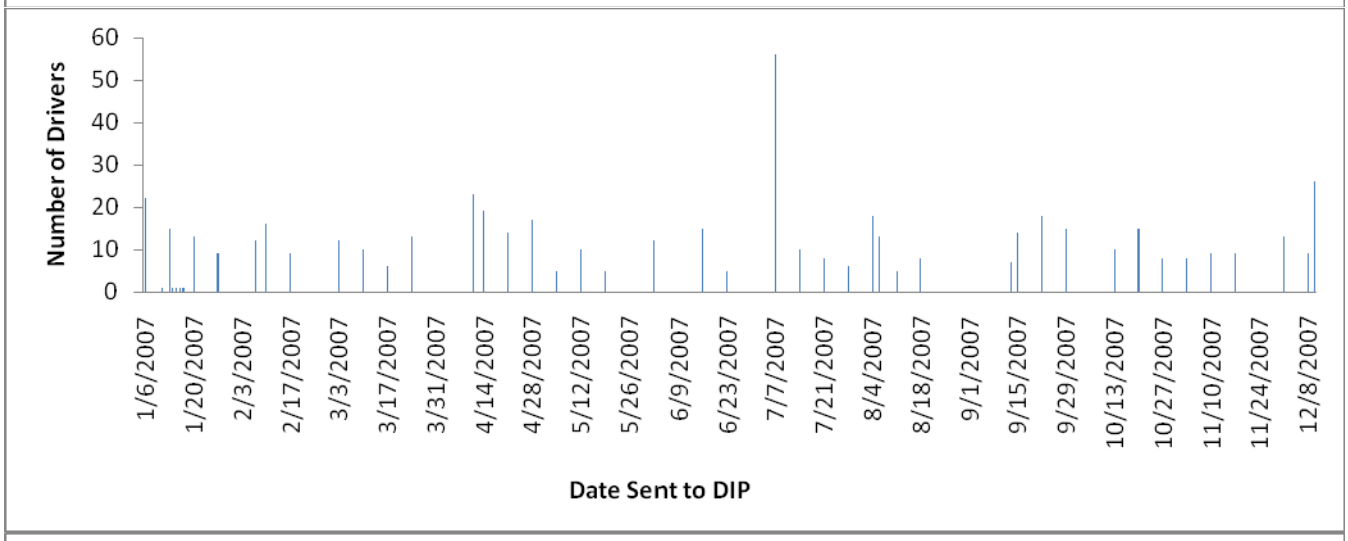


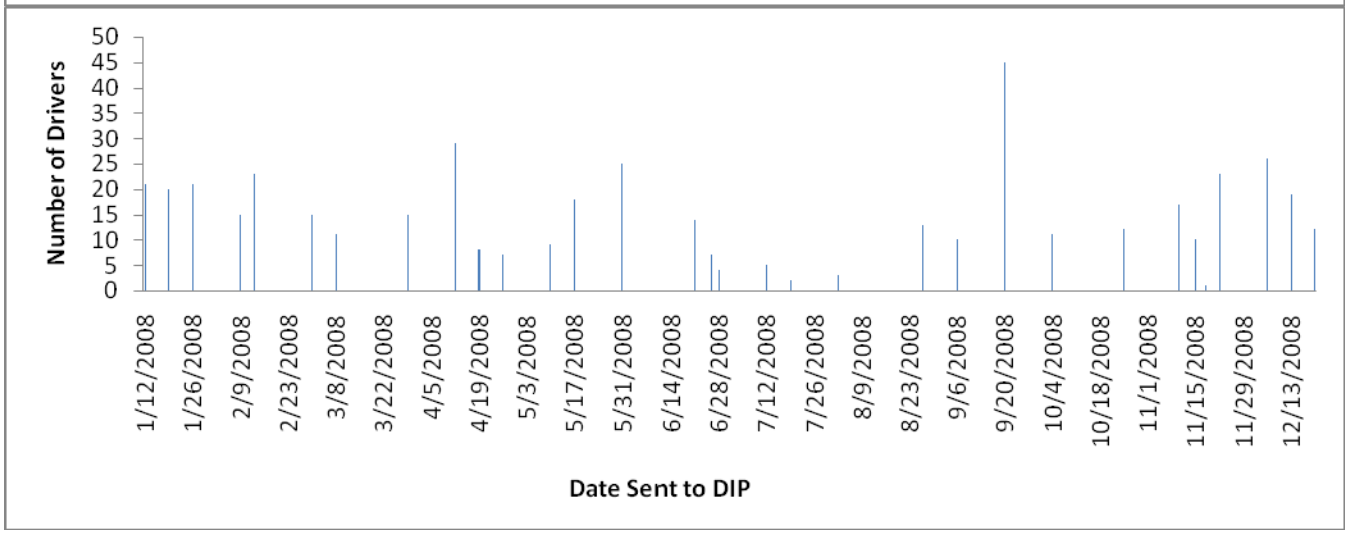




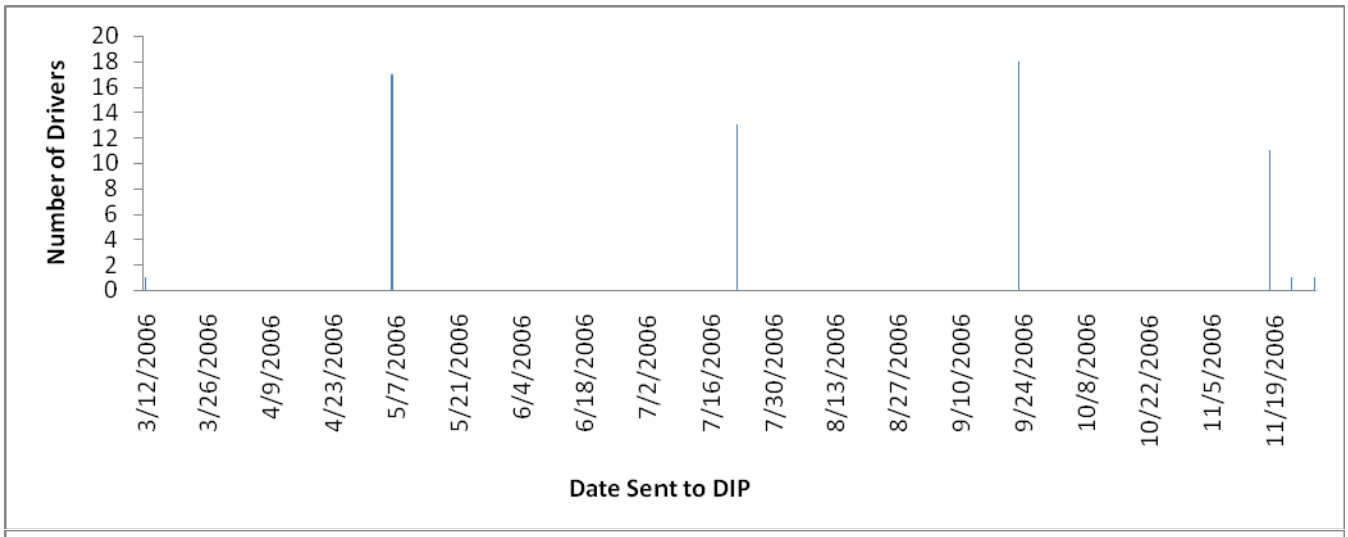
Kirkwood Community College, Cedar Rapids

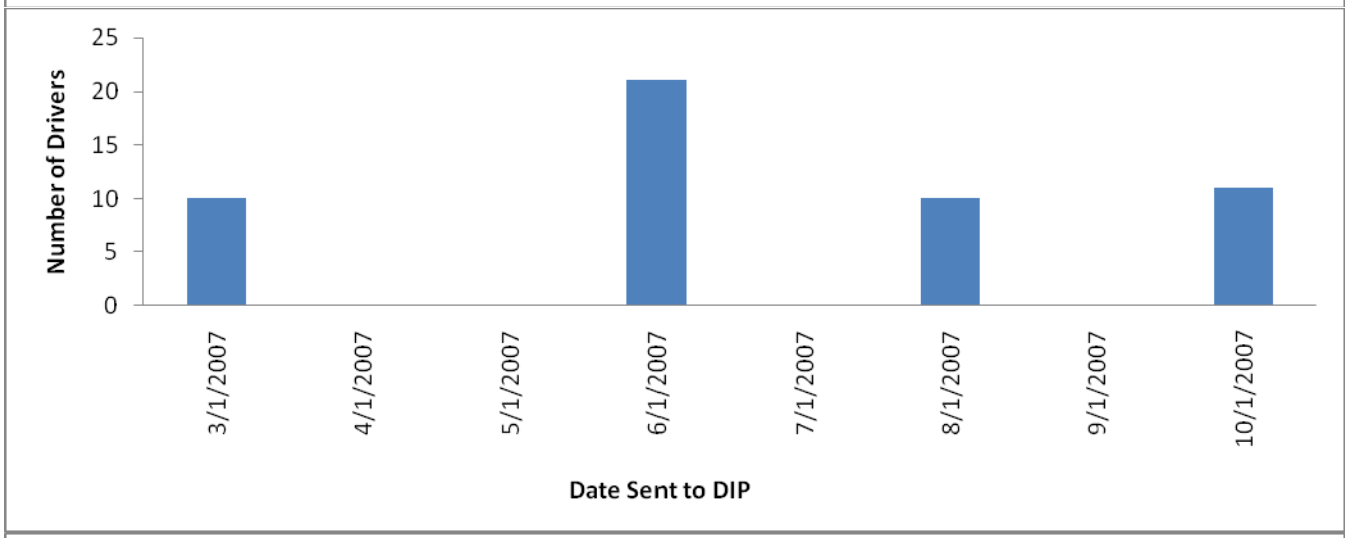


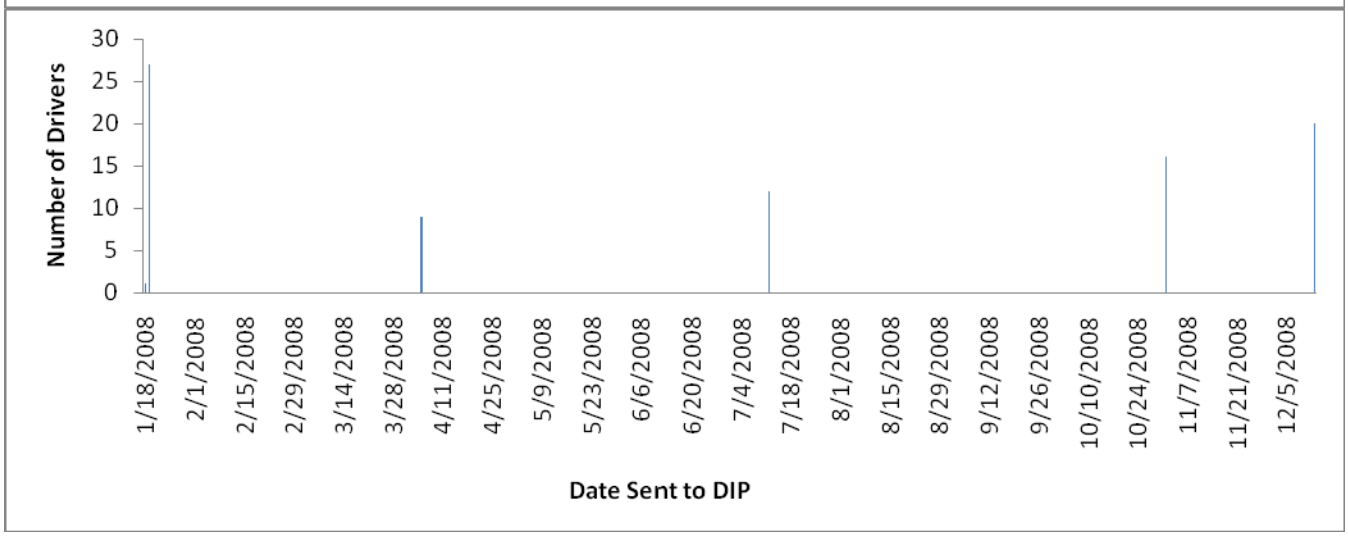




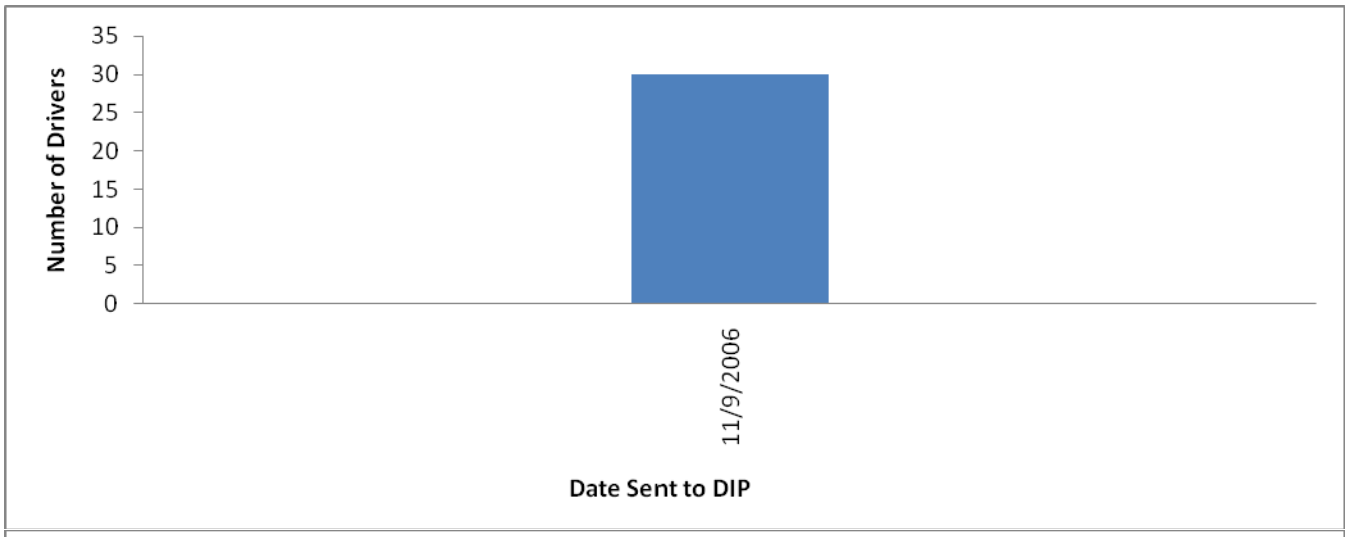
Northwest Iowa Community College, Sheldon

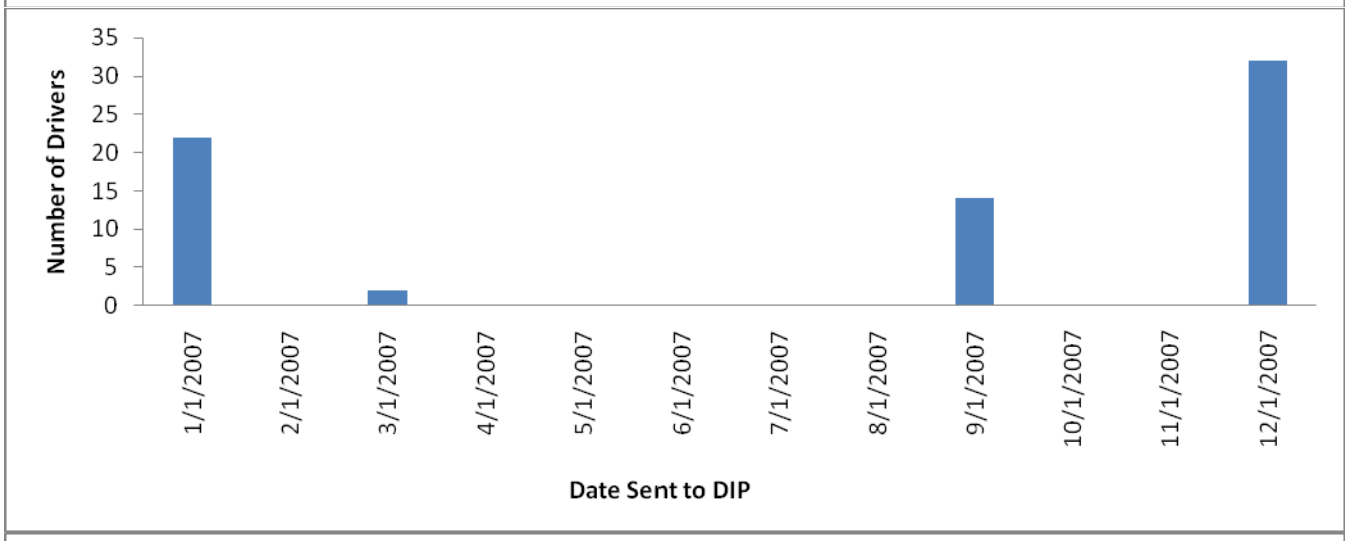


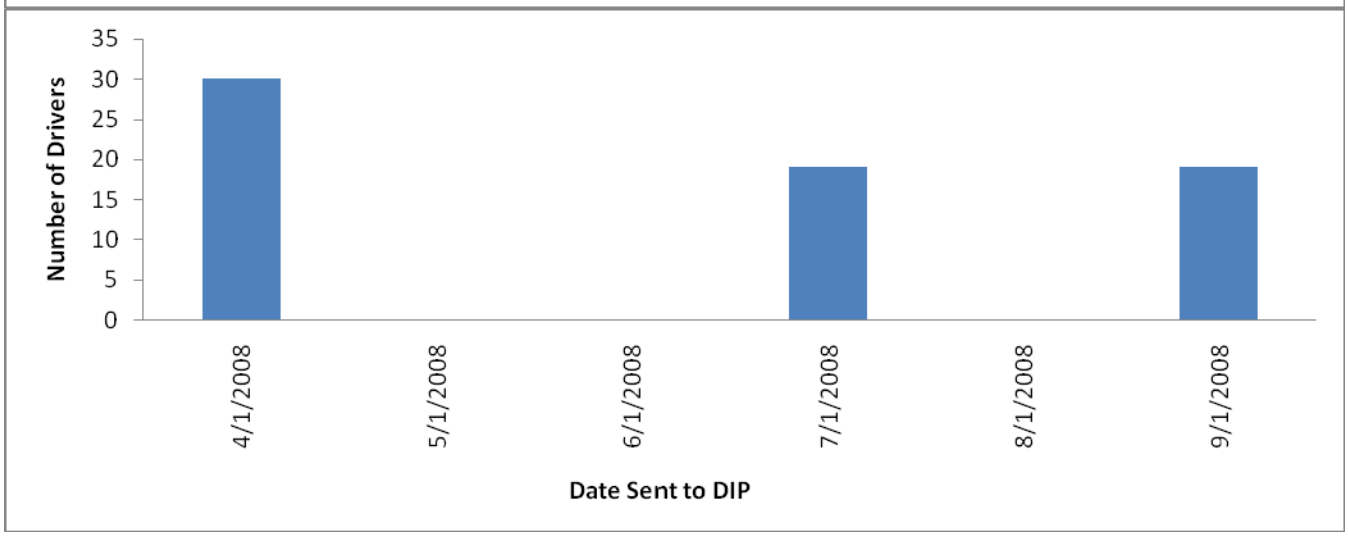




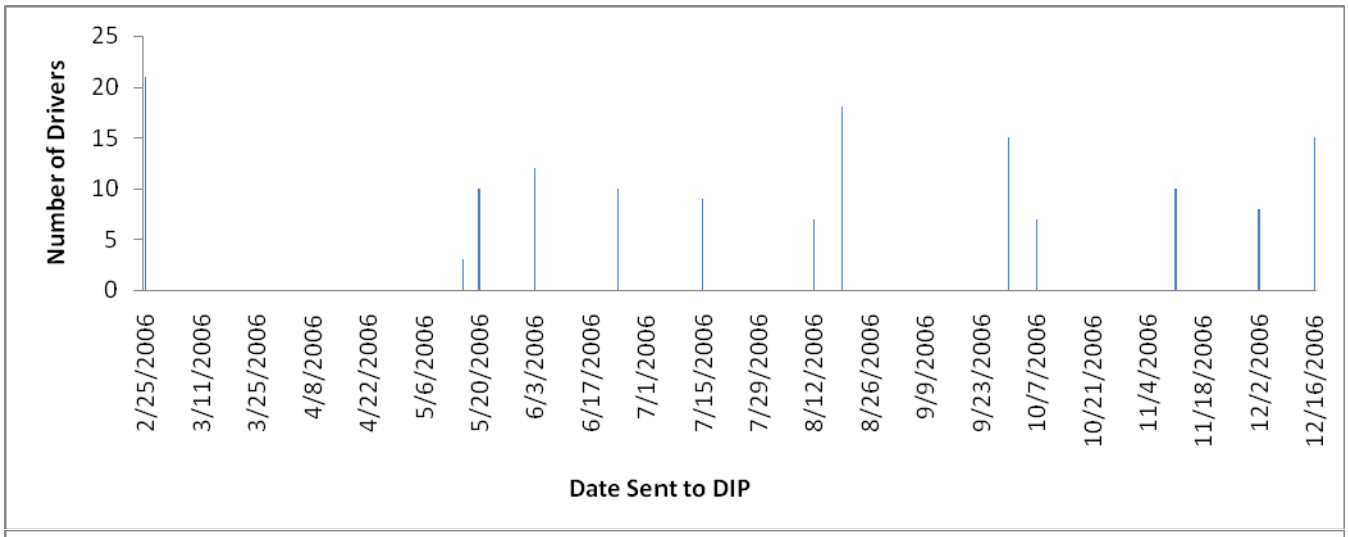
North Iowa Area Community College, Mason City

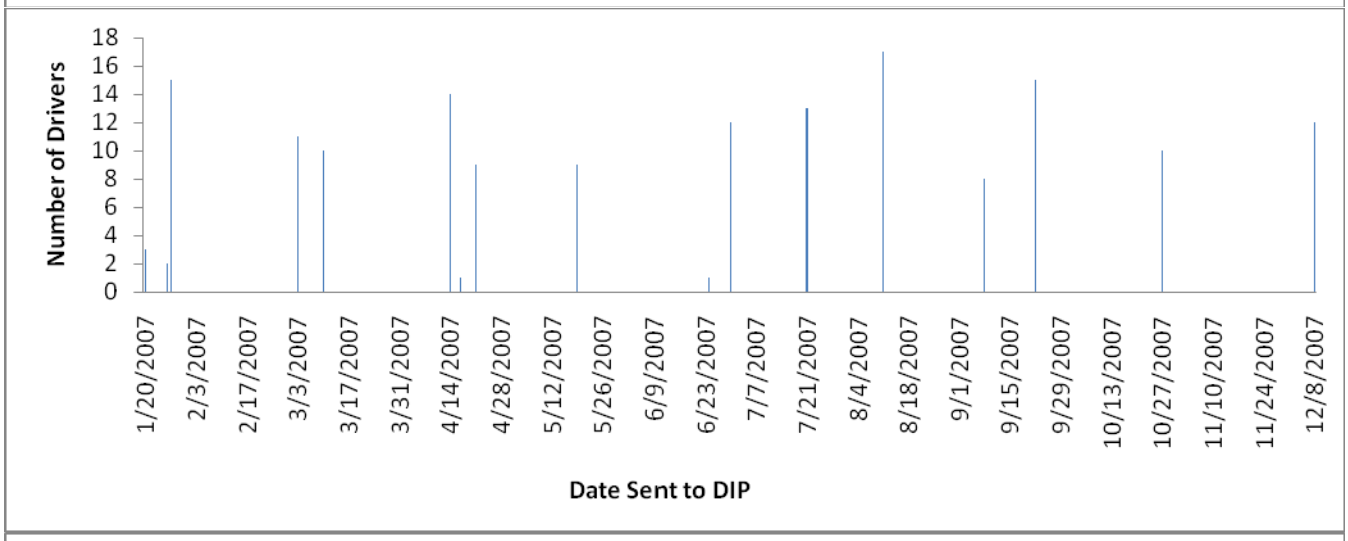


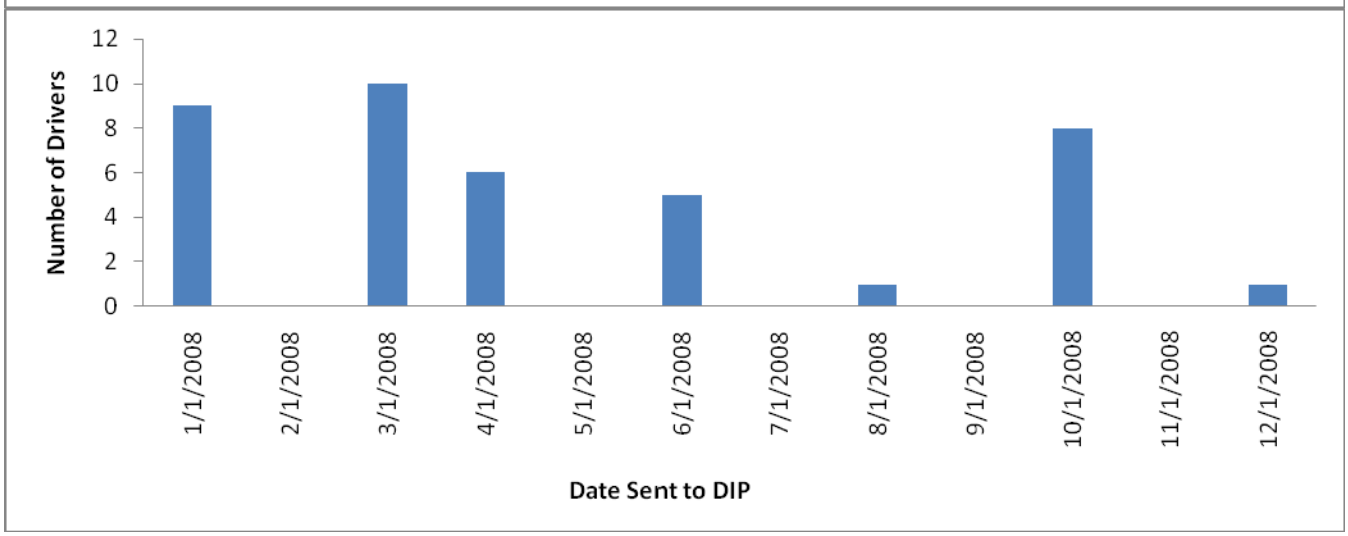




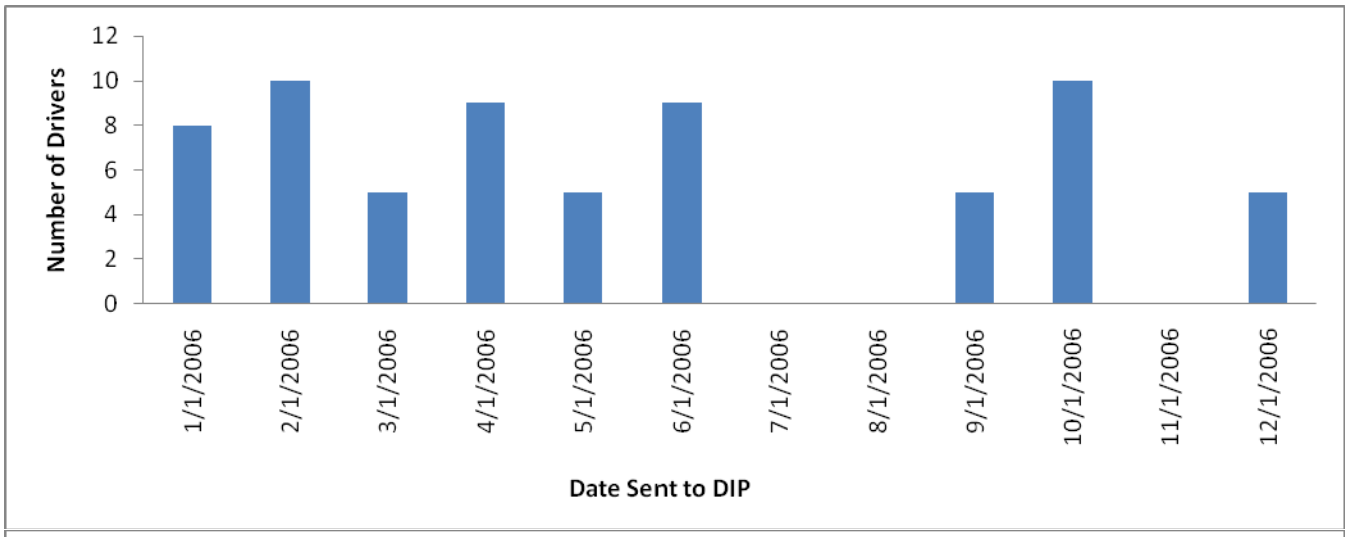
Northeast Iowa Community College, Peosta

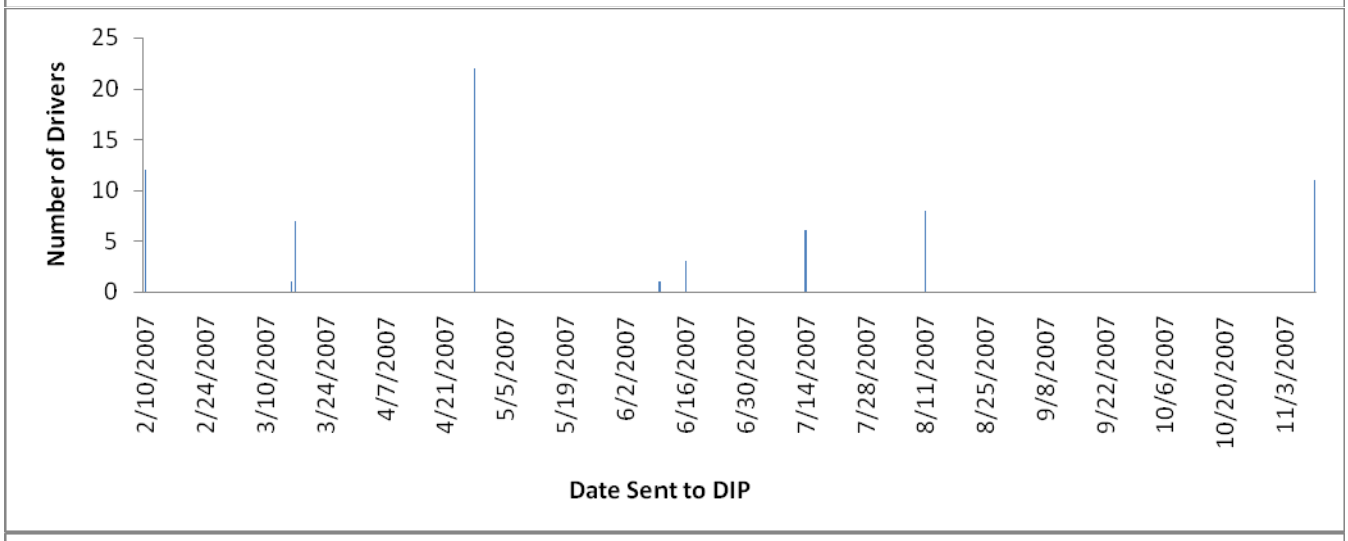


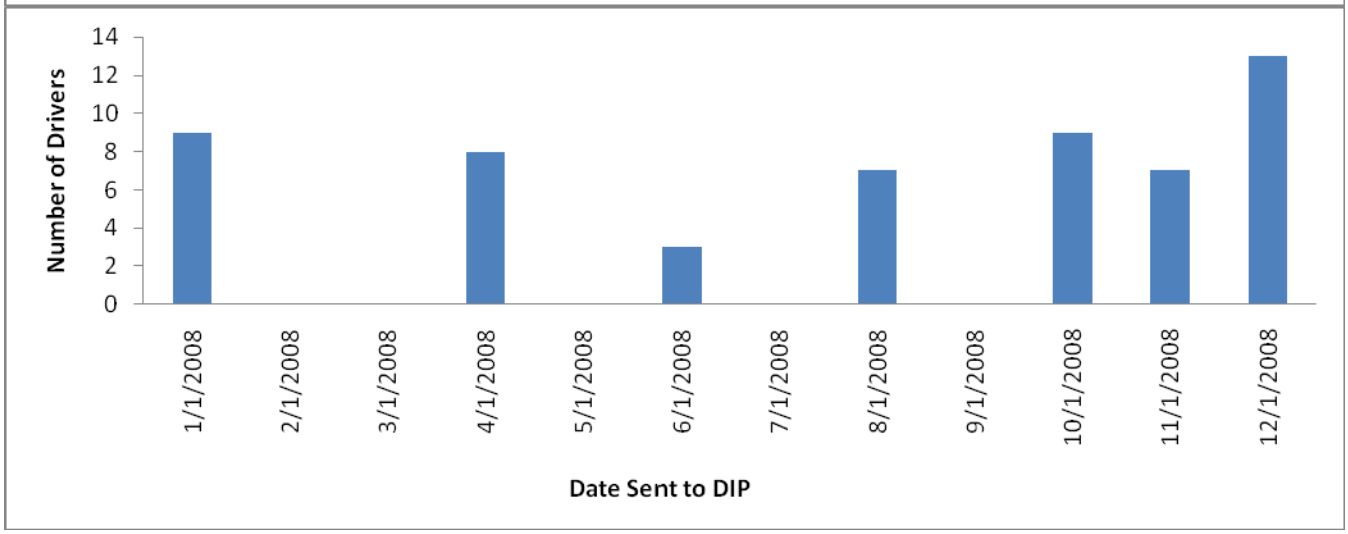




Southwestern Community College, Creston







APPENDIX D. DRIVER CONVICTIONS, CRASHES, AND DIP OUTCOME

Table D.1. Distribution of driver convictions and crashes before and after DIP date

		Before DIP date (by year)				After DIP date(by month)					
		4 years	*3 years*	*2 years*	*1 year*	*1~3*	*4~6*	*7~9*	*10~12*	*13~15*	*16~18*
S_0	*Convictions*	10693	3851	1645	352	0	0	0	0	177	145
	Crashes	878	465	340	105	0	0	0	0	48	18
S_1	*Convictions*	4545	1589	797	117	534	532	474	386	128	92
	Crashes	420	216	161	26	142	138	120	87	25	19
U	*Convictions*	5405	1961	785	151	304	233	202	148	112	77
	Crashes	439	229	165	42	28	30	23	26	23	17

Table D.2 Summary statistics of select interaction factors

Variables	**Mean or Percentage (standard deviation)**
*Gender*Age* Male driver between 21 and 30 yrs old/Male driver between 31 and 40 yrs old/Female driver between 21 and 30 yrs old/ Female driver between 31 and 40 yrs old/Female driver between 41 and 50 yrs old/	31.9/12.5/51.0/19.6/13.4
*Gender*Location* Male driver sent to DMACC/Female driver sent to DMACC /Female driver sent to EIDCC/Female driver sent to KCC	21.6/33.5/12.7/15.1
*Gender*Outcome* Male driver who did not complete DIP/Male driver completed DIP/Female driver who did not complete DIP/Female driver who completed DIP	64.2/48.1/57.1/75.0
Location*Age Driver between 21 and 30 yrs old sent to DMACC	17.0
Location* Outcome Driver who completed DIP at DMACC / Driver who completed DIP at KCC	36.0/10.9
Age*Outcome Driver between 21 and 30 yrs old and did not complete DIP/ Driver between 21 and 30 yrs old and completed DIP/ Driver between 31 and 40 yrs old and completed DIP/ Driver between 41 and 50 yrs old and completed DIP	14.2/36.8/14.4/10.5

Table D.2 Summary statistics of select interaction factors (continued)

Variables	Mean or Percentage (standard deviation)
Gender* Conviction History Male driver with 3 convictions before DIP/Male driver with 4 convictions before DIP/Male driver with 5 convictions before DIP/Female driver with 1 conviction before DIP/ Female driver with 3 convictions before DIP/Female driver with 4 convictions before DIP/Female driver with 5 convictions before DIP	27.7/21.5/15.0/11.0/18.7/ 15.0/11.3
Location* Conviction History Driver with 3 convictions, sent to DMACC	11.0
Age* Conviction History Driver between age 21 to 30 yrs old with 3 convictions before DIP/Driver between age 31 to 40 yrs old with 4 convictions before DIP	17.0/12.4
Outcome* Conviction History Driver with 3 convictions completed DIP/Driver with 4 convictions completed DIP	24.5/17.6
Gender* Conviction History Male driver with zero crash before DIP/Male driver with one crash before DIP/Female driver with zero crash before DIP/ Female driver with one crash before DIP	45.2/15.0/69.3/24.4
Location*Crash History Driver with zero crash before DIP sent to DMACC/ Driver with zero crash before DIP sent to KCC	22.3/10.6
Age* Crash History Driver between 21 and 30 yrs old with no crash before DIP/ Driver between 31 and 40 yrs old with no crash before DIP/ Driver between 41 and 50 yrs old with no crash before DIP/ Driver between 21 and 30 yrs old with one crash before DIP	33.3/14.9/10.2/13.9
Outcome* Crash History Driver with no crash before DIP and did not complete DIP/ Driver with no crash before DIP and completed DIP/ Driver with one crash before DIP and completed DIP	17.6/51.7/18.8

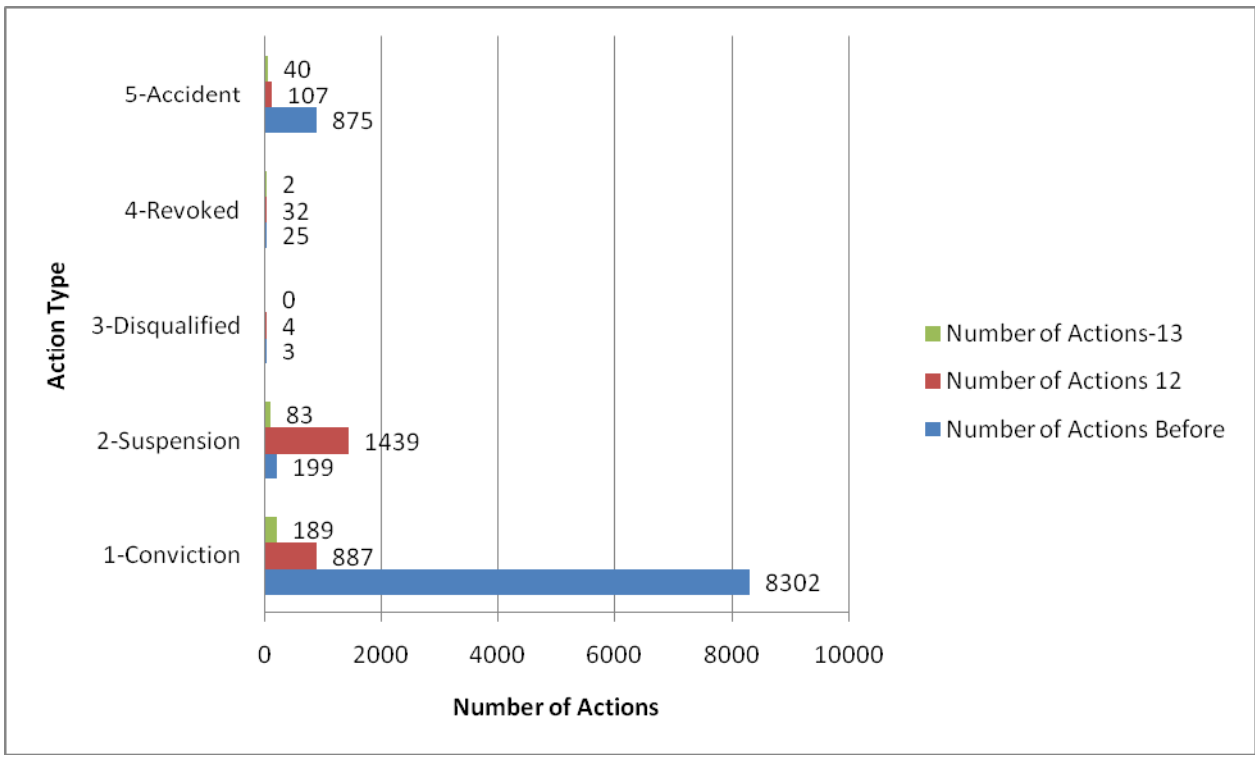


Figure D.1. Distribution of number of actions by action type for drivers in the U group before DIP, during the probation period, and during the 13th- to 18th-month period after DIP date

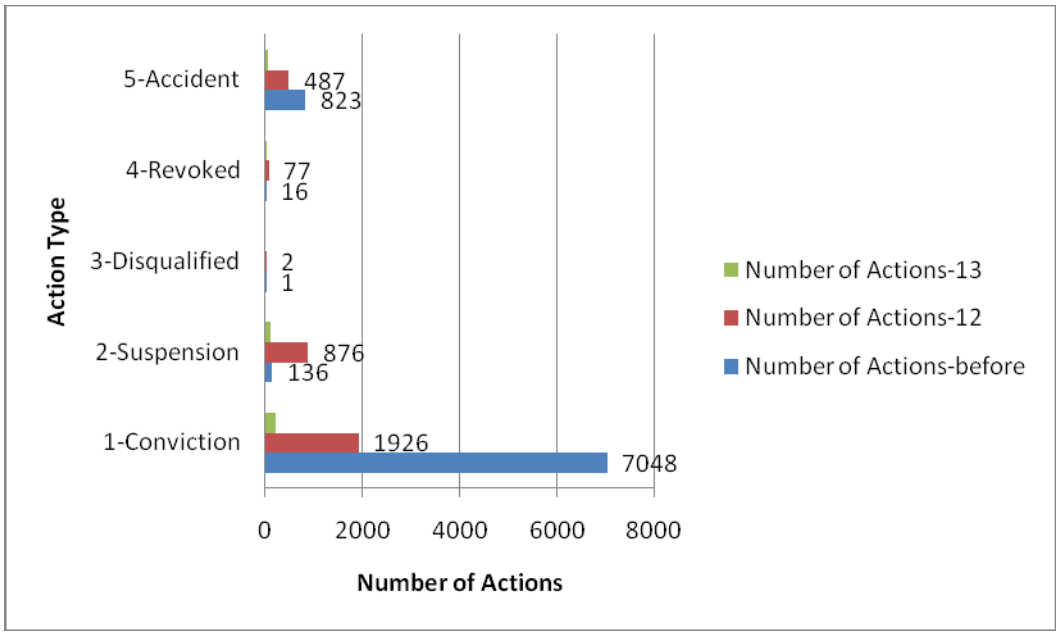


Figure D.2. Distribution of number of actions by action type for drivers in the S_1 group before DIP, during the probation period, and during the 13th- to 18th-month period after DIP date

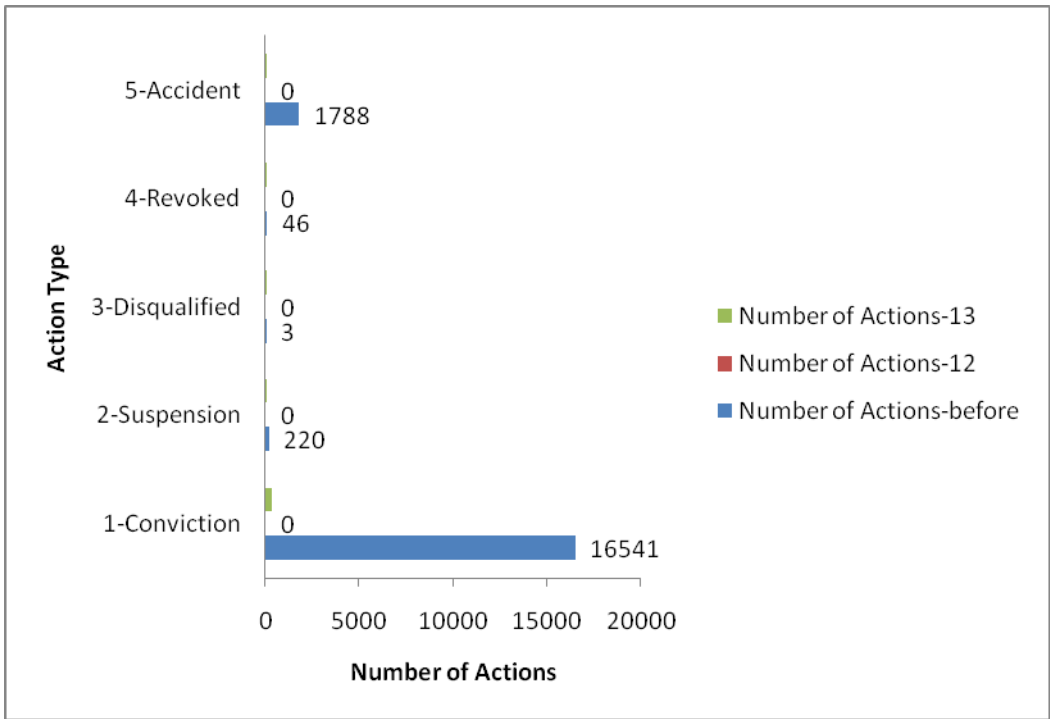


Figure D.3. Distribution of number of actions by action type for drivers in the S_0 group before DIP, during the probation period, and during the 13th- to 18th-month period after DIP date

Monthly Distribution of Crashes/Convictions

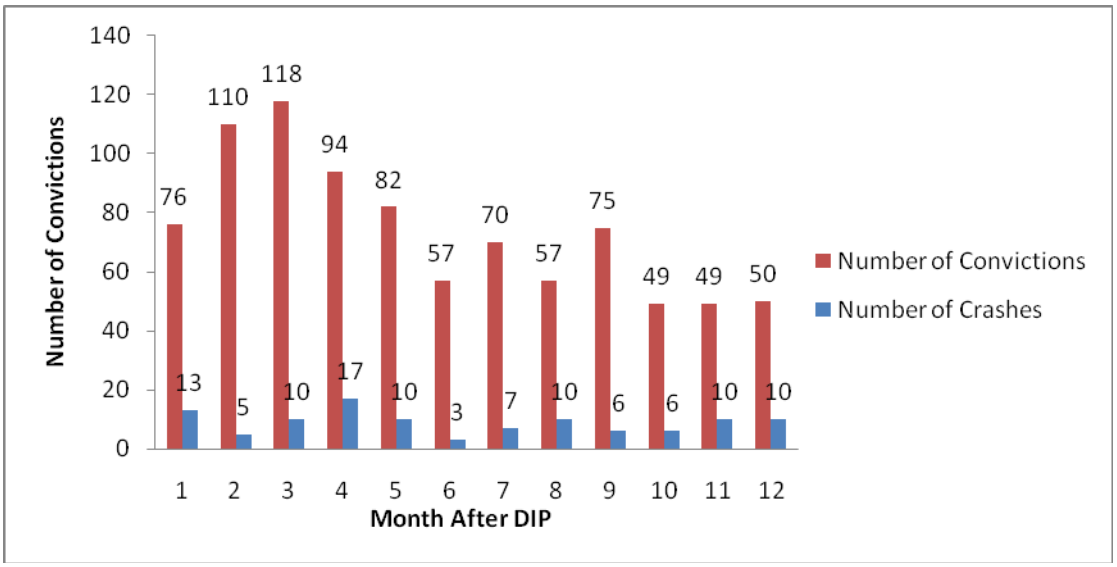


Figure D.4. Distribution of convictions/crashes during the probation period—U group

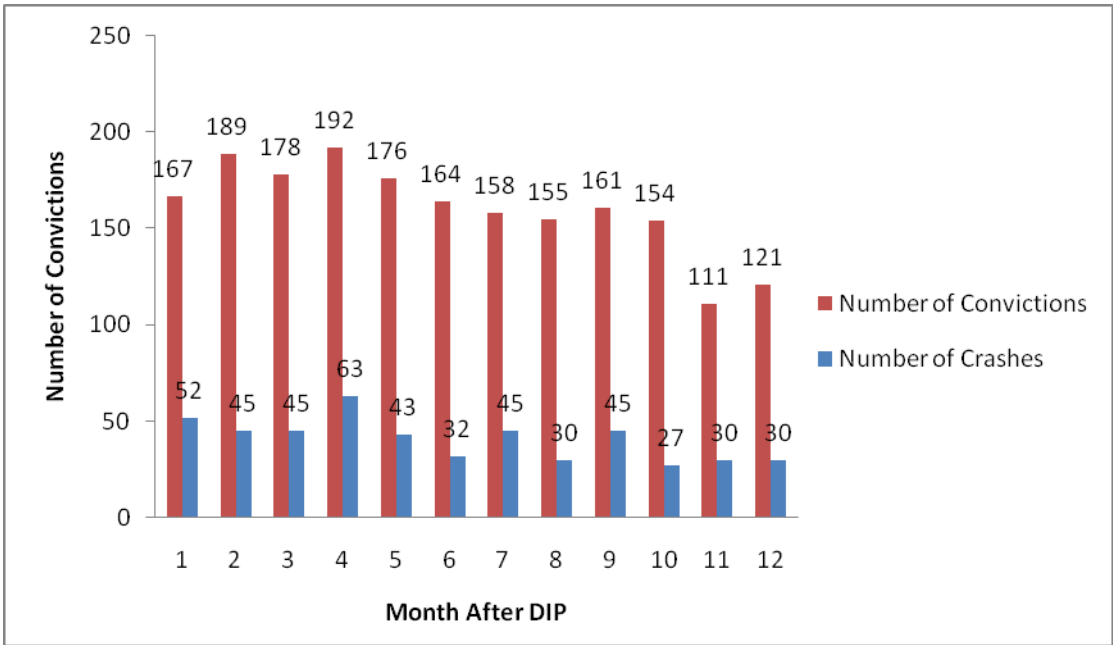


Figure D.5. Distribution of convictions/crashes during the probation period —S_1 group

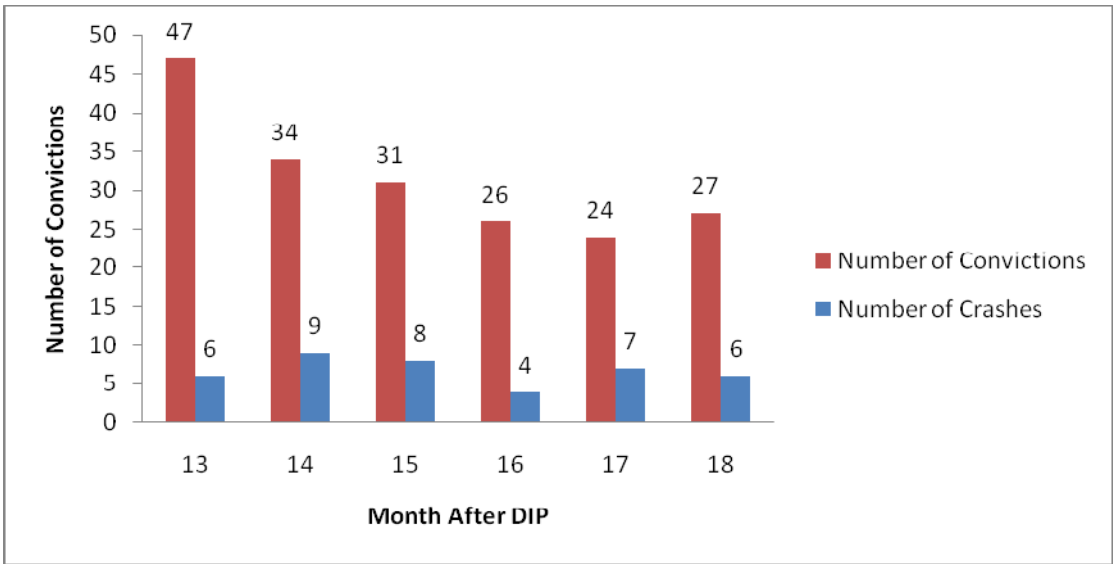


Figure D.6. Distribution of convictions/crashes during the 13th- to 18th month after DIP—U group

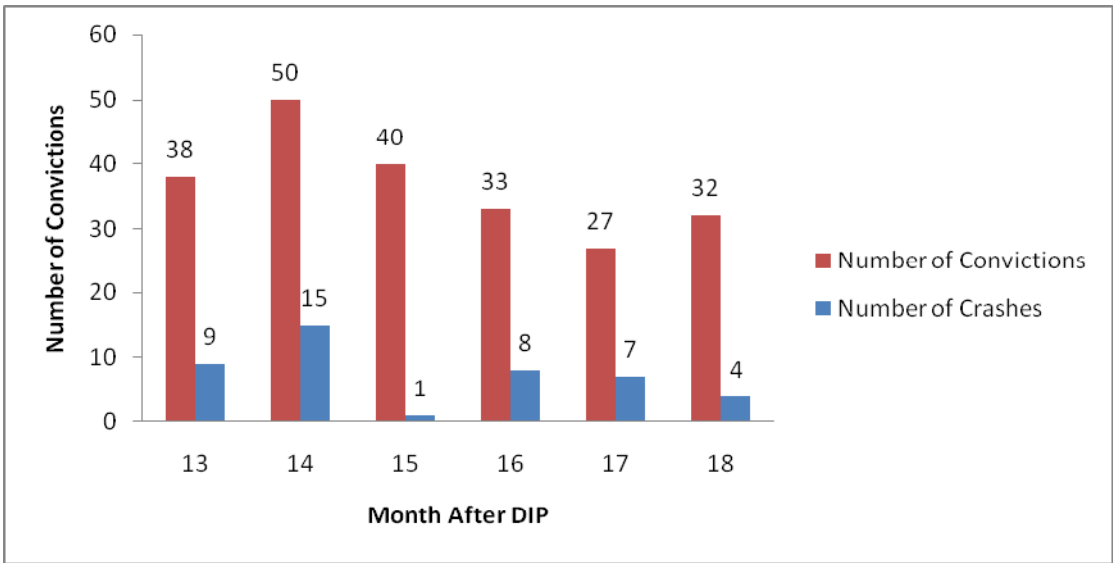


Figure D.7. Distribution of convictions/crashes during the 13th- to 18th-month period after DIP—S_1 group

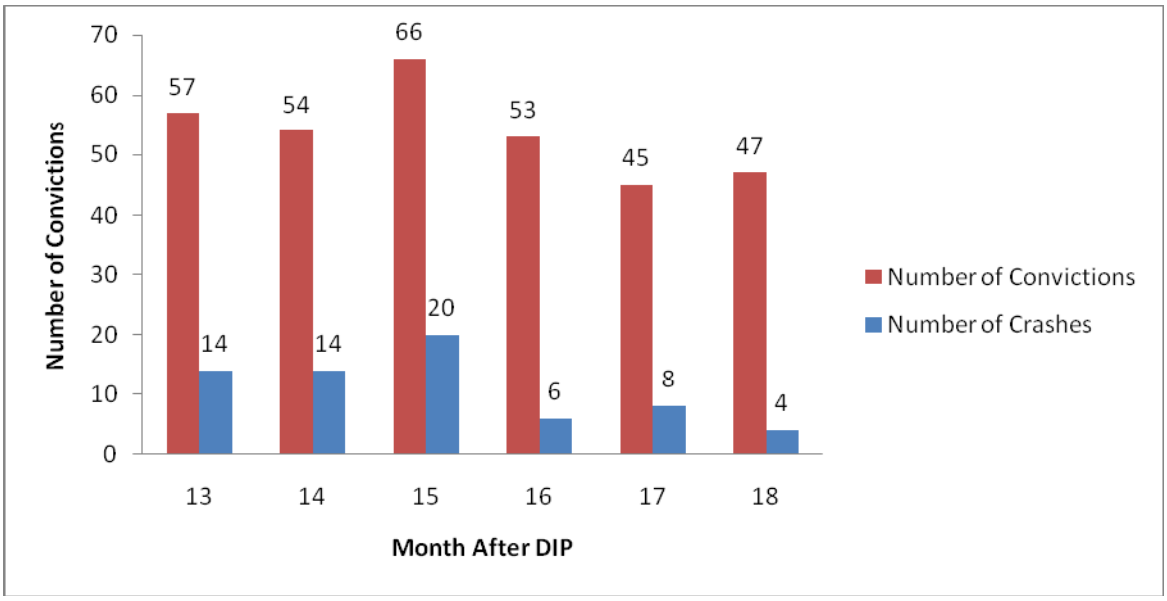
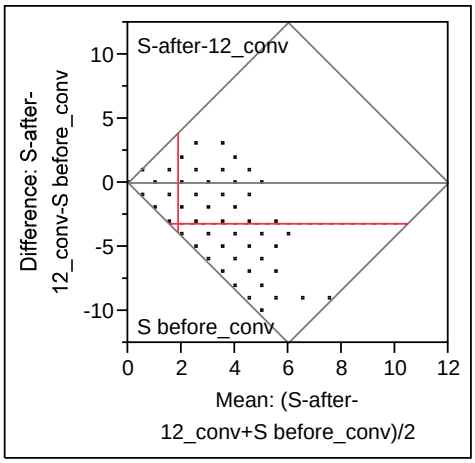


Figure D.8. Distribution of convictions/crashes during the 13th- to 18th-month period after DIP—S_0 group

APPENDIX E. STATISTICAL TESTS AND MODEL OUTPUTS

E.1 Statistical Tests

Differences in the number of convictions for drivers in the satisfactory group (S) before DIP and one year after DIP

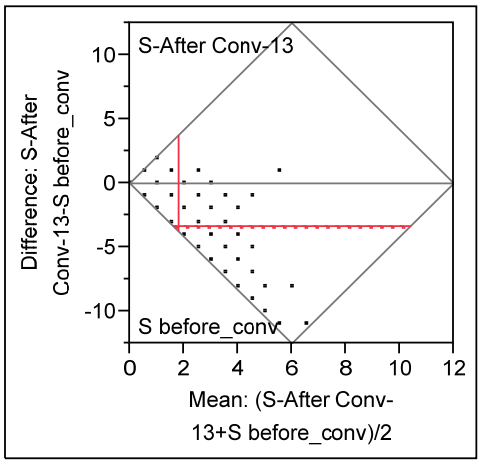


S-after-12_conv	0.28365	t-Ratio	-163.275
S before_conv	3.47408	DF	6789
Mean Difference	-3.1904	Prob > |t|	0.0000*
Std Error	0.01954	Prob > t	1.0000
Upper 95%	-3.1521	Prob < t	0.0000*
Lower 95%	-3.2287		
N	6790		
Correlation	0.12567		

Wilcoxon Sign-Rank

	Convictions after–Convictions Before
Test Statistic	-1.1e+7
Prob > |z|	0.0000*
Prob > z	1.0000
Prob < z	0.0000*

Differences in number of convictions for drivers in the satisfactory group (S) before DIP during the 13th- to 18th-month period subsequent to DIP

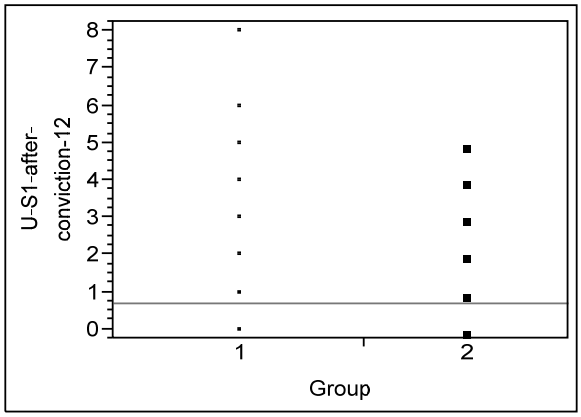


S-After Conv-13	0.07982	t-Ratio	-176.141
S before_conv	3.47408	DF	6789
Mean Difference	-3.3943	Prob > |t|	0.0000*
Std Error	0.01927	Prob > t	1.0000
Upper 95%	-3.3565	Prob < t	0.0000*
Lower 95%	-3.432		
N	6790		
Correlation	0.03961		

Wilcoxon Sign-Rank

	Convictions after_13-Convictions Before
Test Statistic	-1.1e+7
Prob > |z|	0.0000*
Prob > z	1.0000
Prob < z	0.0000*

Differences in the number of convictions between the U and S_1 groups one year after DIP



Missing Rows
421

Wilcoxon/Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
1	2265	3586058	1583.25	-31.113
2	1844	4857937	2634.46	31.113

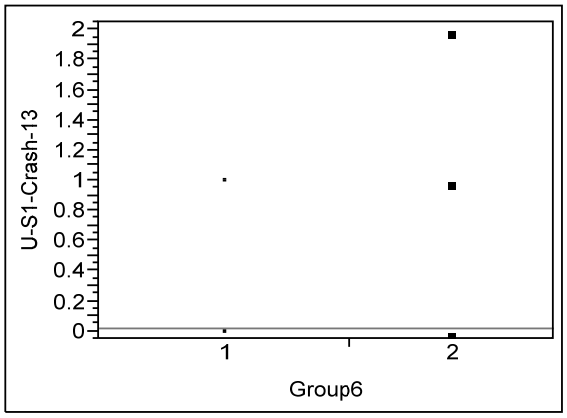
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
4857937	31.11277	0.0000*

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
968.0051	1	<.0001*

Differences in the number of convictions between the U and S groups during the 13th- to 18th-month period subsequent to DIP



Missing Rows
421

Wilcoxon/Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
1	2265	4643850	2050.26	-1.171
2	1844	3800145	2060.82	1.171

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
3800145	1.17060	0.2418

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
1.3704	1	0.2417

E.2 Binary Probit Model Outputs

Binary probit model for conviction occurrence after DIP during probation period

```
PROBIT;lhs=x15;rhs=one,eiccd,maleage2,fe_age2,u,age2lo1,lo1S,malco5,fe_co3,age
2cr0,age2cr1$
+--------------------------------------------+
| Binomial Probit Model            |
| Maximum Likelihood Estimates        |
| Model estimated: Nov 13, 2009 at 11:07:31AM.|
| Dependent variable         X15   |
| Weighting variable         None   |
| Number of observations       9055   |
| Iterations completed         5   |
| Log likelihood function    -4816.861   |
| Number of parameters         12   |
| Info. Criterion: AIC =     1.06656   |
|  Finite Sample: AIC =     1.06657   |
| Info. Criterion: BIC =     1.07599   |
| Info. Criterion:HQIC =     1.06977   |
| Restricted log likelihood   -4879.943   |
| McFadden Pseudo R-squared   .0129269   |
| Chi squared          126.1647   |
| Degrees of freedom          11   |
| Prob[ChiSqd > value] =     .0000000   |
| Hosmer-Lemeshow chi-squared =  2.52630   |
| P-value= .96049 with deg.fr. =    8   |
+--------------------------------------------+
+--------+--------------+----------------+--------+--------+----------+
|Variable| Coefficient | Standard Error |b/St.Er.|P[|Z|>z]| Mean of X|
+--------+--------------+----------------+--------+--------+----------+
---------+Index function for probability
 Constant|  -.89786810    .03021608  -29.715  .0000
 EICCD  |  -.09914562    .04700458  -2.109  .0349  .12744340
 MALEAGE2|   .38327408    .07892488   4.856  .0000  .31882938
 FE_AGE2 |   .39776975    .08127945   4.894  .0000  .19072336
 U    |   .20635278    .03673848   5.617  .0000  .25013805
 AGE2LO1 |  -.15031970    .05341505  -2.814  .0049  .16951960
 LO1S  |   .16481095    .04543017   3.628  .0003  .25113197
 MALCO5 |   .17211594    .05204322   3.307  .0009  .08271673
 FE_CO1 |  -.33355304    .08231056  -4.052  .0001  .04351187
 FE_CO3 |  -.13737637    .05035689  -2.728  .0064  .12059636
 AGE2CR0 |  -.17604572    .07528510  -2.338  .0194  .33296521
 AGE2CR1 |  -.21375285    .08084431  -2.644  .0082  .13903920
```

```
+---------------------------------------+
| Fit Measures for Binomial Choice Model |
| Probit  model for variable X15        |
+---------------------------------------+
| Proportions P0= .770293  P1= .229707 |
| N =  9055 N0=  6975  N1=  2080 |
| LogL=  -4816.861 LogL0=  -4879.943 |
| Estrella = 1-(L/L0)^(-2L0/n) = .01393 |
+---------------------------------------+
|   Efron | McFadden | Ben./Lerman |
|  .01366 |  .01293 |    .65099 |
|  Cramer | Veall/Zim. |   Rsqrd_ML |
|  .01375 |  .02649 |    .01384 |
+---------------------------------------+
| Information Akaike I.C. Schwarz I.C. |
| Criteria    1.06656    1.07599 |
+---------------------------------------+
+-----------------------------------------------------------+
|Predictions for Binary Choice Model. Predicted value is |
|1 when probability is greater than .500000, 0 otherwise.|
|Note, column or row total percentages may not sum to   |
|100% because of rounding. Percentages are of full sample.|
+------+-----------------------------+----------------+
|Actual|     Predicted Value         |                |
|Value |    0        1    | Total Actual  |
+------+----------------+----------------+----------------+
| 0  |  6975 ( 77.0%)|   0 (  .0%)|  6975 ( 77.0%)|
| 1  |  2080 ( 23.0%)|   0 (  .0%)|  2080 ( 23.0%)|
+------+----------------+----------------+----------------+
|Total |  9055 (100.0%)|   0 (  .0%)|  9055 (100.0%)|
+------+----------------+----------------+----------------+

======================================================================
Analysis of Binary Choice Model Predictions Based on Threshold = .5000
----------------------------------------------------------------------
Prediction Success
----------------------------------------------------------------------
Sensitivity = actual 1s correctly predicted           .000%
Specificity = actual 0s correctly predicted        100.000%
Positive predictive value = predicted 1s that were actual 1s   .000%
Negative predictive value = predicted 0s that were actual 0s  77.029%
Correct prediction = actual 1s and 0s correctly predicted    77.029%
----------------------------------------------------------------------
Prediction Failure
----------------------------------------------------------------------
False pos. for true neg. = actual 0s predicted as 1s       .000%
False neg. for true pos. = actual 1s predicted as 0s    100.000%
False pos. for predicted pos. = predicted 1s actual 0s      .000%
False neg. for predicted neg. = predicted 0s actual 1s    22.971%
False predictions = actual 1s and 0s incorrectly predicted   22.971%
======================================================================
```

Binary probit model for conviction occurrence after DIP during 13th to 18th month

```
--> PROBIT;lhs=x17;rhs=one,age2,lo1S,fe_co1,kcc$

+-------------------------------------------+
| Binomial Probit Model            |
| Maximum Likelihood Estimates        |
| Model estimated: Nov 13, 2009 at 11:13:00AM.|
| Dependent variable         X17   |
| Weighting variable         None   |
| Number of observations       9055   |
| Iterations completed         7   |
| Log likelihood function    -2197.227   |
| Number of parameters         5   |
| Info. Criterion: AIC =      .48641   |
|  Finite Sample: AIC =      .48641   |
| Info. Criterion: BIC =      .49034   |
| Info. Criterion:HQIC =      .48775   |
| Restricted log likelihood   -2221.359   |
| McFadden Pseudo R-squared   .0108635   |
| Chi squared          48.26347   |
| Degrees of freedom          4   |
| Prob[ChiSqd > value] =     .0000000   |
| Hosmer-Lemeshow chi-squared = 10.19659   |
| P-value= .25150 with deg.fr. =    8   |
+-------------------------------------------+
+--------+--------------+----------------+--------+--------+----------+
|Variable| Coefficient | Standard Error |b/St.Er.|P[|Z|>z]| Mean of X|
+--------+--------------+----------------+--------+--------+----------+
---------+Index function for probability
 Constant|  -1.87135183    .10829537  -17.280  .0000
 AGE2   |   .41778738    .10926538   3.824  .0001  .93539481
 LO1S   |  -.15989460    .05160912  -3.098  .0019  .25113197
 FE_CO1 |  -.35349169    .12792835  -2.763  .0057  .04351187
 KCC    |   .12256808    .05466948   2.242  .0250  .15140806

+----------------------------------------+
| Fit Measures for Binomial Choice Model |
| Probit  model for variable X17    |
+----------------------------------------+
| Proportions P0= .933186  P1= .066814 |
| N =  9055 N0=  8450  N1=   605 |
| LogL=  -2197.227 LogL0=  -2221.359 |
| Estrella = 1-(L/L0)^(-2L0/n) = .00534 |
+----------------------------------------+
|   Efron | McFadden | Ben./Lerman |
|  .00498 |  .01086 |    .87591 |
|  Cramer | Veall/Zim. |   Rsqrd_ML |
|  .00484 |  .01611 |    .00532 |
+----------------------------------------+
| Information Akaike I.C. Schwarz I.C. |
| Criteria     .48641    .49034 |
+----------------------------------------+
```

+---+
|Predictions for Binary Choice Model. Predicted value is |
|1 when probability is greater than .500000, 0 otherwise.|
|Note, column or row total percentages may not sum to |
|100% because of rounding. Percentages are of full sample.|
+------+---------------------------------+----------------+
|Actual| Predicted Value | |
|Value | 0   1 | Total Actual |
+------+----------------+----------------+----------------+
| 0 | 8450 (93.3%)| 0 (.0%)| 8450 (93.3%)|
| 1 | 605 (6.7%)| 0 (.0%)| 605 (6.7%)|
+------+----------------+----------------+----------------+
|Total | 9055 (100.0%)| 0 (.0%)| 9055 (100.0%)|
+------+----------------+----------------+----------------+

==
Analysis of Binary Choice Model Predictions Based on Threshold = .5000

Prediction Success

Sensitivity = actual 1s correctly predicted   .000%
Specificity = actual 0s correctly predicted   100.000%
Positive predictive value = predicted 1s that were actual 1s   .000%
Negative predictive value = predicted 0s that were actual 0s 93.319%
Correct prediction = actual 1s and 0s correctly predicted   93.319%

Prediction Failure

False pos. for true neg. = actual 0s predicted as 1s   .000%
False neg. for true pos. = actual 1s predicted as 0s   100.000%
False pos. for predicted pos. = predicted 1s actual 0s   .000%
False neg. for predicted neg. = predicted 0s actual 1s   6.681%
False predictions = actual 1s and 0s incorrectly predicted   6.681%
==

E.3 Negative Binomial Model Outputs

Frequency of convictions after DIP during probation period

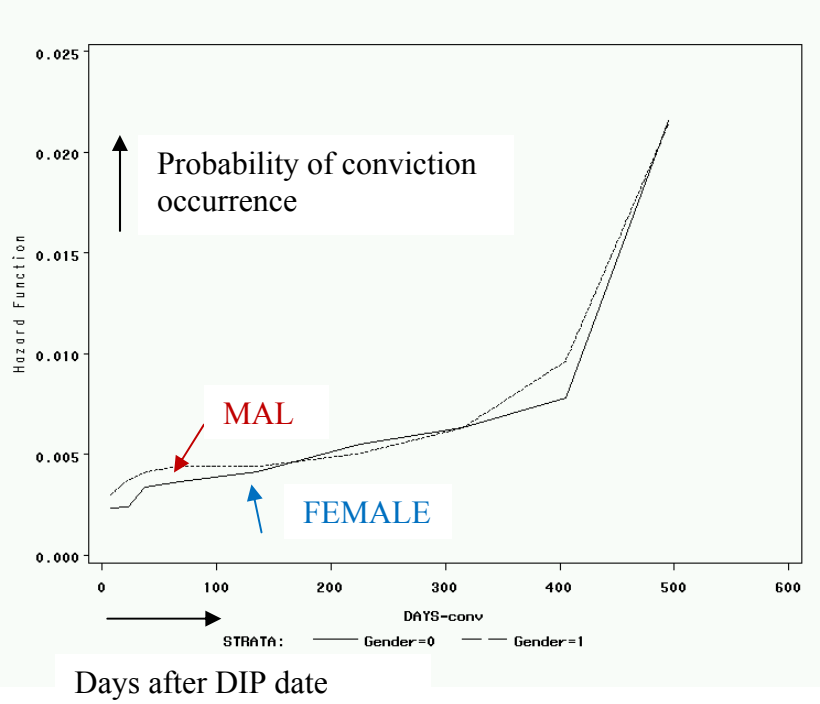
```
-->negbin;lhs=x9;rhs=one,u,age2,age2cr0,age2cr1,lo1s,age2lo1,fe_co3,
fe_co1,lo11s$
+---------------------------------------------+
| Negative Binomial Regression                |
| Maximum Likelihood Estimates                |
| Model estimated: Nov 13, 2009 at 10:51:07AM.|
| Dependent variable                 X9       |
| Weighting variable               None       |
| Number of observations             9055     |
| Iterations completed               14       |
| Log likelihood function        -6415.607    |
| Number of parameters               11       |
| Info. Criterion: AIC =          1.41946     |
|  Finite Sample: AIC =          1.41946      |
| Info. Criterion: BIC =          1.42810     |
| Info. Criterion:HQIC =          1.42240     |
| Restricted log likelihood       -6613.610   |
| McFadden Pseudo R-squared       .0299386    |
| Chi squared                  396.0045       |
| Degrees of freedom                 1        |
| Prob[ChiSqd > value] =          .0000000    |
| NegBin form 2; Psi(i) = theta               |
+---------------------------------------------+
+--------+-------------+----------------+--------+--------+----------+
|Variable| Coefficient | Standard Error |b/St.Er.|P[|Z|>z]| Mean of X|
+--------+-------------+----------------+--------+--------+----------+
 Constant|  -1.46880997    .05098137  -28.811  .0000
 U       |   .43383021    .05741149   7.557  .0000  .25013805
 AGE2    |   .58861596    .11339262   5.191  .0000  .50955273
 AGE2CR0 |  -.26994471    .11050409  -2.443  .0146  .33296521
 AGE2CR1 |  -.26506019    .11748575  -2.256  .0241  .13903920
 LO1S    |   .35020713    .07279906   4.811  .0000  .35969078
 AGE2LO1 |  -.24074691    .08198098  -2.937  .0033  .16951960
 FE_CO3  |  -.18863811    .06652598  -2.836  .0046  .18729983
 FE_CO1  |  -.40318447    .08965158  -4.497  .0000  .11021535
 LO11S   |  -.24666536    .09519830  -2.591  .0096  .10855881
---------+Dispersion parameter for count data model
 Alpha   |  1.18111660    .08753602  13.493  .0000
```

Frequency of Convictions after DIP during 13th to 18th month

```
--> negbin;lhs=x11;rhs=one,age2,age3,age4,lo1s,lo11s,conv5,fe_co1$
+---------------------------------------------+
| Negative Binomial Regression                |
| Maximum Likelihood Estimates                |
| Model estimated: Nov 13, 2009 at 10:48:36AM.|
| Dependent variable          X11             |
| Weighting variable          None            |
| Number of observations       9055           |
| Iterations completed         11             |
| Log likelihood function    -2531.316        |
| Number of parameters         9              |
| Info. Criterion: AIC =      .56109          |
|  Finite Sample: AIC =      .56109           |
| Info. Criterion: BIC =      .56815          |
| Info. Criterion:HQIC =      .56349          |
| Restricted log likelihood   -2636.912       |
| McFadden Pseudo R-squared   .0400450        |
| Chi squared          211.1904               |
| Degrees of freedom           1              |
| Prob[ChiSqd > value] =     .0000000         |
| NegBin form 2; Psi(i) = theta               |
+---------------------------------------------+
+--------+-------------+----------------+--------+--------+----------+
|Variable| Coefficient | Standard Error |b/St.Er.|P[|Z|>z]| Mean of X|
+--------+-------------+----------------+--------+--------+----------+
 Constant|  -2.90959230    .13361185  -21.776  .0000
 AGE2    |   .49436776    .14137232    3.497  .0005  .50955273
 AGE3    |   .48395243    .16257725    2.977  .0029  .19602430
 AGE4    |   .43266359    .17172041    2.520  .0117  .13373827
 LO1S    |  -.25196911    .10572578   -2.383  .0172  .35969078
 LO11S   |   .56623479    .14680752    3.857  .0001  .10855881
 CONV5   |   .23130709    .11409214    2.027  .0426  .12876864
 FE_CO1  |  -.57080932    .17947947   -3.180  .0015  .11021535
---------+Dispersion parameter for count data model
 Alpha   |  3.97753393    .50993722    7.800  .0000
```

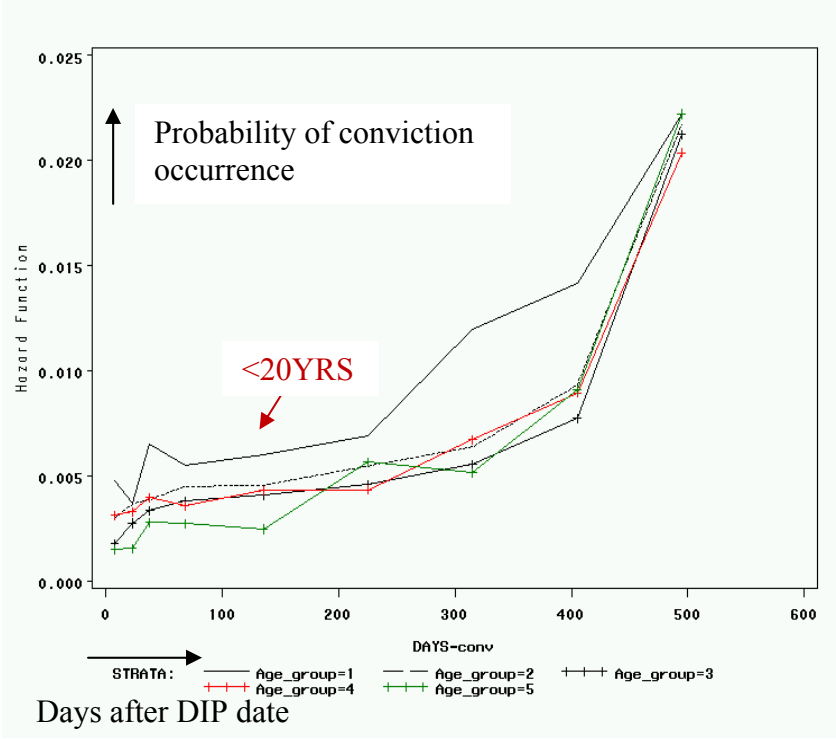
E.4 Hazard Function Plots

By Gender



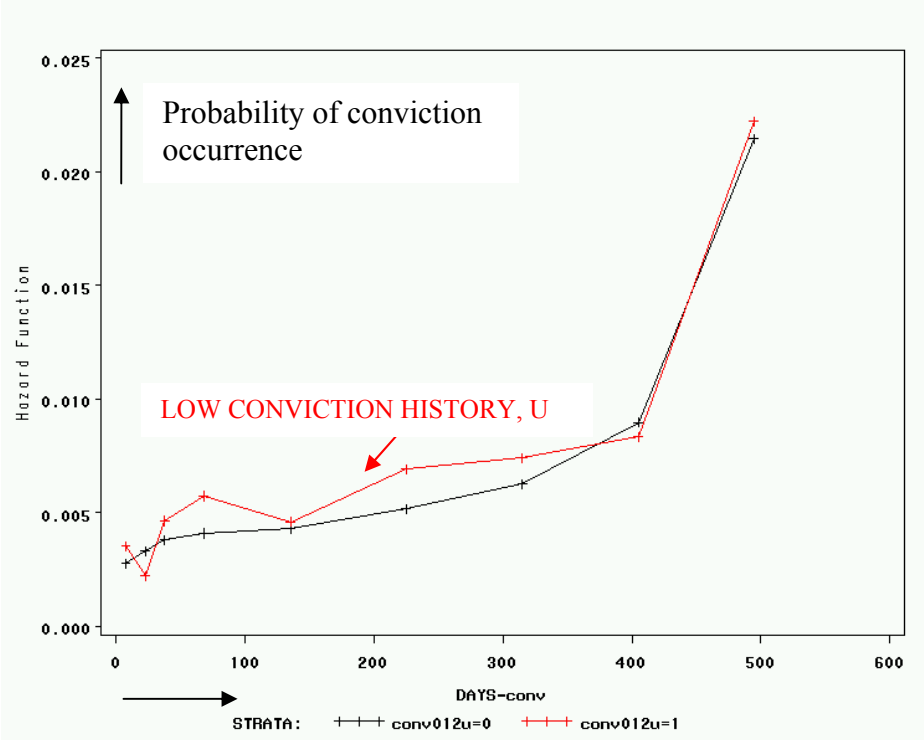
Days after DIP date

By Age

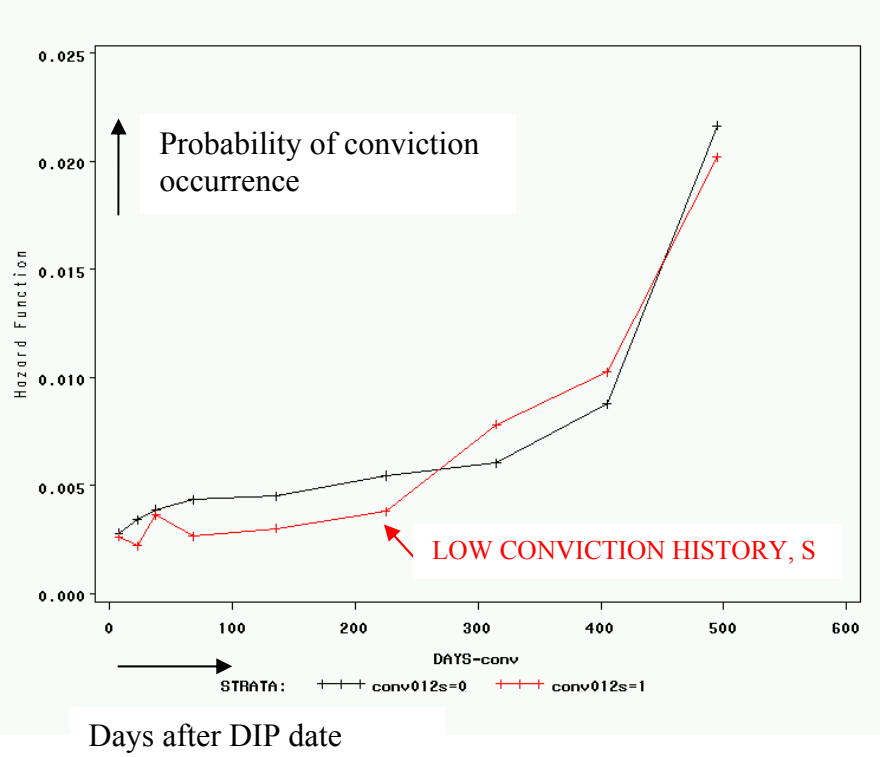


Days after DIP date

By Conviction History and Outcome (S or U)



Days after DIP date



Days after DIP date

E.5 Weibull Model Output

This is the output for the Weibull survival function. For interpretation of results, the hazard function is preferable. It can be shown that there is an exact equivalence between the survival and hazard functions. The relationship between the parameters is given as follows (Allison 1995):

$$\beta_{hazard} = -\frac{\beta_{survival}}{scale\ (\sigma)}.$$

The LIFEREG Procedure

Model Information

Data Set	SASUSER.SURVIVAL4
Dependent Variable	Log(DAYS_conv) DAYS-conv
Number of Observations	2486
Noncensored Values	2486
Right Censored Values	0
Left Censored Values	0
Interval Censored Values	0
Zero or Negative Response	6569
Name of Distribution	Weibull
Log Likelihood	-3262.740216

Number of Observations Read	9055
Number of Observations Used	2486

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
Gender	1	4.3967	0.0360
Age_group	1	26.8637	<.0001
Outcome	1	8.7407	0.0031
Before_Conv	1	20.7628	<.0001
outcomedmacc	1	5.7330	0.0166
KCC	1	2.8451	0.0917

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	5.3123	0.0621	5.1906	5.4340	7321.95	<.0001
Gender	1	-0.0662	0.0316	-0.1280	-0.0043	4.40	0.0360
Age_group	1	0.0786	0.0152	0.0489	0.1083	26.86	<.0001
Outcome	1	0.1054	0.0357	0.0355	0.1753	8.74	0.0031
Before_Conv	1	-0.0430	0.0094	-0.0615	-0.0245	20.76	<.0001
outcomedmacc	1	-0.0920	0.0384	-0.1673	-0.0167	5.73	0.0166
KCC	1	0.0701	0.0416	-0.0114	0.1516	2.85	0.0917
Scale	1	0.7445	0.0121	0.7211	0.7687		
Weibull Shape	1	1.3432	0.0219	1.3009	1.3868		