



**THE SPECIFIC DETERRENT IMPACT OF CALIFORNIA'S
0.08% BLOOD ALCOHOL CONCENTRATION LIMIT AND
ADMINISTRATIVE PER SE LICENSE SUSPENSION LAWS**

**Volume 2
of**

**AN EVALUATION OF THE EFFECTIVENESS OF CALIFORNIA'S
0.08% BLOOD ALCOHOL CONCENTRATION LIMIT AND
ADMINISTRATIVE PER SE LICENSE SUSPENSION LAWS**

JANUARY 1997

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE January 1997	3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE Specific Deterrent Impact of California's 0.08% Blood Alcohol Concentration Limit and Administrative Per Se License Suspension Laws Volume 2 of: An Evaluation of the Effectiveness of California's 0.08% Blood Alcohol Concentration Limit and Administrative Per Se License Suspension Laws			5. FUNDING NUMBERS	
6. AUTHOR(S) Patrice N. Rogers				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) California Department of Motor Vehicles Research and Development Section P.O. Box 932382 Sacramento, CA 94232-3820			8. PERFORMING ORGANIZATION REPORT NUMBER RSS-97-167	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Traffic Safety 7000 Franklin Boulevard, Suite 440 Sacramento, CA 95823			10. SPONSORING/MONITORING AGENCY REPORT NUMBER AL9101	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This project evaluated the impact of two new California driving-under-the-influence (DUI) laws on the subsequent alcohol-related accident and recidivism rates of apprehended DUI offenders. The first law, effective January 1, 1990, reduced the state's illegal per se blood alcohol concentration (BAC) limit to 0.08% and the second, effective just six months later, on July 1, 1990, imposed an administrative per se (APS) pre-conviction license suspension on arrested DUI offenders. Logistic regression analysis was used to evaluate the specific deterrent impact of the new laws by comparing the subsequent recidivism and alcohol-related accident rates of DUI offenders arrested before and after implementation of the new laws. The evaluation showed that the new laws were highly effective in reducing subsequent accidents and recidivism among DUI offenders, whether or not the offenders were subsequently convicted of their offense. There were significant reductions in all three of the 1-year indices of recidivism assessed (1-year subsequent total accidents, had-been-drinking accidents, and DUI convictions), with reduction magnitudes ranging between 19.5% and 37.1% from pre-law recidivism rates. The magnitude and consistency of the reductions provide compelling evidence that administrative license suspension is a highly effective means of reducing recidivism among first and repeat DUI offenders. The enactment of the 0.08% law accentuated the net deterrent effect of the APS law by increasing the number of DUI offenders who were suspended by about 3,300 per year.				
14. SUBJECT TERMS motor vehicle accidents, government policy, law, logistic regression, specific deterrence, administrative per se, illegal per se, 0.08 BAC, DUI countermeasures			15. NUMBER OF PAGES 55	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

PREFACE

This report is the second volume of a two volume report entitled *An Evaluation of the Effectiveness of California's 0.08% Blood Alcohol Concentration Limit and Administrative Per Se License Suspension Laws*. This project is a part of the California Traffic Safety Program and was funded by the National Highway Traffic Safety Administration through a grant administered by the California Office of Traffic Safety (Grant #AL9101). The present report is being issued as a departmental publication rather than an official State of California policy monograph. The opinions, findings, and conclusions expressed in this report are therefore those of the author and not necessarily those of the State of California or the National Highway Traffic Safety Administration.

ACKNOWLEDGMENTS

The author wishes to acknowledge the individuals who contributed to the successful completion of this project. In particular, appreciation and thanks are extended to Leonard A. Marowitz, Research Program Specialist, for his assistance in writing some of the computer programs used in categorizing subjects and to William C. Marsh, Research Program Specialist II (Retired Annuitant), and Michael A. Gebers, Research Program Specialist, for their assistance with some of the statistical methodology.

Additional thanks go to Douglas Luong, Office Technician, for his assistance in completing the tables of the report and to Debbie McKenzie, Associate Governmental Program Analyst, for overseeing the report publication.

This study was conducted under the general direction of Raymond C. Peck, DMV Research Chief, and the supervision of Clifford J. Helander, Research Manager. The author wishes to thank them for their thorough reviews of, and contributions to, the report drafts.

Finally, the author is especially indebted to Helen N. Tashima, Research Program Specialist, for her generous assistance with nearly every aspect of this project. In addition to supplying all of the raw DUI data used in the evaluation, she also provided continuous and adept guidance in handling the complex data fields and structuring the analyses that ultimately enabled appropriate interpretation of the study results.

EXECUTIVE SUMMARY

Background

- Currently in California, almost 30% of persons arrested for driving-under-the-influence (DUI) are not convicted of the offense. For those who are convicted, lengthy time lags between arrest, conviction, and postconviction license actions cannot help but diminish the deterrent effect of post-conviction sanctions. In spite of these delays, post-conviction license suspension has long proven to be an effective traffic safety countermeasure. When handled through administrative processes independently of the criminal justice system, however, such actions are imposed more swiftly and certainly, giving them a greater potential for deterring offenders from recidivating.

- California's administrative per se (APS) law, implemented on July 1, 1990, requires the Department of Motor Vehicles (DMV) to impose an immediate suspension of the driving privilege of DUI arrestees having a blood alcohol concentration (BAC) level equal to or in excess of the legal limit. Six months prior to implementation of the APS law, California reduced its "illegal per se" BAC level from 0.10% to 0.08%. This law had the effect of slightly broadening the range of drivers subject to both APS suspension and court adjudication.
- Most of the research to date on the effectiveness of administrative license actions has focused on the general deterrent effects of such laws (such as the evaluation of California's law presented in Volume 1 of this report). In these studies, administrative license actions have consistently been shown to be superior to other sanction options in causing a general deterrent impact. Significant decreases in DUI recidivism rates were also found in one of the few studies of the *specific* deterrent impact of administrative license suspension laws on DUI offenders (Stewart, Gruenewald, & Roth, 1989). Specific deterrence refers to the impact of the punishment experience on sensitizing apprehended offenders to the threat of further punishment for committing a similar crime in the future (Ross, 1992). The current study assesses the specific deterrent impact of the new laws, if any, on the incidence of subsequent drunk driving among apprehended DUI offenders by comparing DUI recidivism and accident rates before and after implementation of the new laws.

The California APS License Suspension Law

- The California APS law requires the DMV to suspend or revoke the driving privilege of persons who are arrested for driving with a BAC of 0.08% or more or who refuse or fail to complete a BAC chemical test upon arrest. The offender's driver license is seized by the arresting officer upon arrest. Due process of law is allowed by the issuance of a 30-day temporary license intended to provide the driver with sufficient time to challenge the suspension through DMV administrative review. Suspension lengths vary depending on the offender's 7-year prior DUI conviction history and whether the offender submitted to or refused a BAC test.

The 0.08% BAC Per Se Limit Law

- Research has shown that most driving related skills are impaired at BACs as low as 0.03%-0.05%, and that accident responsibility increases with BAC level. On January 1, 1990, just six months before imposing the APS law, California became only the fourth state (after Oregon, Utah, and Maine) to lower the illegal per se limit to 0.08% BAC. Under per se laws, drivers are statutorily defined as impaired and driving illegally if they exceed the prescribed level, irrespective of the degree of observed behavioral impairment.

Research Design and Data Development

- In this volume we quantify the extent to which the immediate administrative *pre-conviction* license suspension actions produced a specific deterrent effect in the

presence of the reduced BAC per se limit. Study 1 of this volume compared the subsequent records of all DUI offenders arrested in 1989 (a pre-law comparison group who would not have received the APS suspension) to those of all DUI offenders arrested in 1991 (the post-law group who would have received the APS suspension). Logistic regression analysis was used to predict the likelihood that subjects would reoffend or have accidents during the first year following their arrest. This analysis provides estimates which determine the likelihood of reoffense given membership in a particular group. To address the possibility that offenders in the two time periods (the pre- and post-APS periods) might not be comparable with regard to their prior driving histories, and to reduce the error variance that might otherwise impede the ability to detect the impact of the laws, several prior driver record variables were included in the analyses as important covariates that served to reduce the error and give greater confidence that the resulting group differences were, in fact, related to the introduction of the laws and not to the prevalent downward trend in all accidents that occurred during the post-law period.

- Arrest data were provided by the Department of Justice (DOJ), and the oldest pre-law comparison data that were available dated back only to arrests made in 1989, just one year immediately prior to introduction of the new laws. This did not allow a complete “APS-free” comparison year of follow-up actions for all subjects in that group. Hence, the comparison group was actually potentially “contaminated” by the study condition. Consequently, in addition to this main study of data provided by DOJ, a second study (Study 2) was performed which compared the subsequent recidivism rates of a sample of offenders identified from the DMV driver record database who were arrested during 1986 or 1987 and convicted in 1987 (a period 2 to 3 years prior to the introduction of the laws) to those of a sample of offenders arrested during 1991 or 1992 and convicted in 1992. Offenders in Study 1 were not necessarily convicted of the DUI offense which led to their arrest, while in this second study all of the offenders were convicted of DUI or alcohol-related reckless driving as a result of their group-qualifying arrest.
- Offenders within each study were further categorized into two groups formed on the basis of their prior conviction history. It was expected that the APS law may have a greater deterrent impact on repeat offenders since they receive a substantially longer suspension term than do first offenders.
- BAC-test refusers could not be identified in the pre-APS period of either evaluation, so refusers were not grouped separately for the purposes of this study. However, in any given year, test refusers account for only 6% to 7% of the DUI population and were therefore considered unlikely to significantly effect or bias the groups.
- In both studies, three 1-year subsequent indices of recidivism were considered:
 - total accidents;
 - alcohol-involved accidents (designated by the police as “had-been-drinking” or “HBD” accidents);
 - DUI or alcohol-related “wet-reckless” driving convictions.

Results

Process Measures

- In the first five years of the APS law, over one million license actions were taken and most offenders did not request a hearing. When hearings were requested the suspension action was usually upheld, although there has been a trend toward increases in the rate of hearing requests and decreases in the proportion of sustained actions since the law has been in effect.

Subsequent Driving Record Measures

Subsequent Total Accidents

- In both studies, the odds of offenders arrested in the post-law period being involved in a 1-year subsequent accident were significantly less than those of offenders arrested in the pre-law period, and repeat offenders were significantly *less* likely to be in a 1-year subsequent accident than were first offenders.
- First offenders who were arrested in 1991 (post-APS) were 34.1% less likely to be involved in a subsequent accident than were those arrested in 1989.
- Repeat offenders arrested in 1991 were 33.8% less likely to be involved in a subsequent accident than were those arrested in 1989.
- The sample of first offenders convicted in 1992 were 36.6% less likely to be involved in a subsequent accident than were those convicted in 1987.
- The sample of repeat offenders convicted in 1992 were 37.1% less likely to be involved in a subsequent accident than were repeat offenders convicted in 1987.

Figure 1 shows the adjusted proportions of 1-year subsequent total accident-involved drivers for the pre- and post-law years.

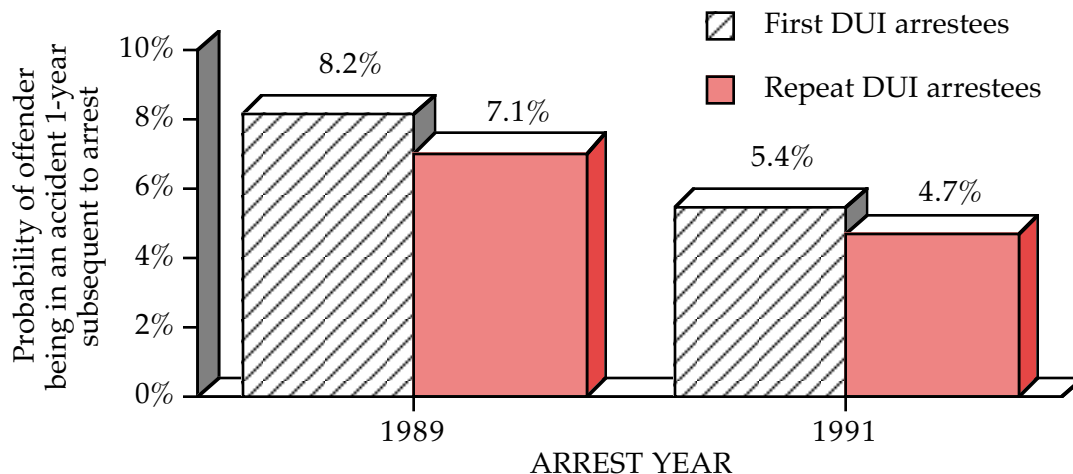


Figure 1. Adjusted probability of being in an accident 1-year subsequent to DUI arrest, by offender group, and arrest year.

Subsequent HBD Accidents

- In both studies, first and repeat offenders arrested in the post-law period were significantly less likely to be involved in a 1-year subsequent HBD accident than were those arrested in the pre-law period. Among offenders in Study 1, first and repeat offenders arrested after the new laws had 27.3% fewer HBD accidents than did those arrested before the new laws. Among the samples of offenders in Study 2, first and repeat offenders convicted in 1992 were 33.3% less likely to be involved in a subsequent HBD accident during the year following their arrest than were offenders convicted in 1987.
- In both studies, the odds of a repeat offender incurring a subsequent HBD accident were significantly greater than those of a first offender.

Figure 2 shows the adjusted proportions of 1-year subsequent “had-been-drinking” (HBD) accident involved drivers for the pre- and post-law years.

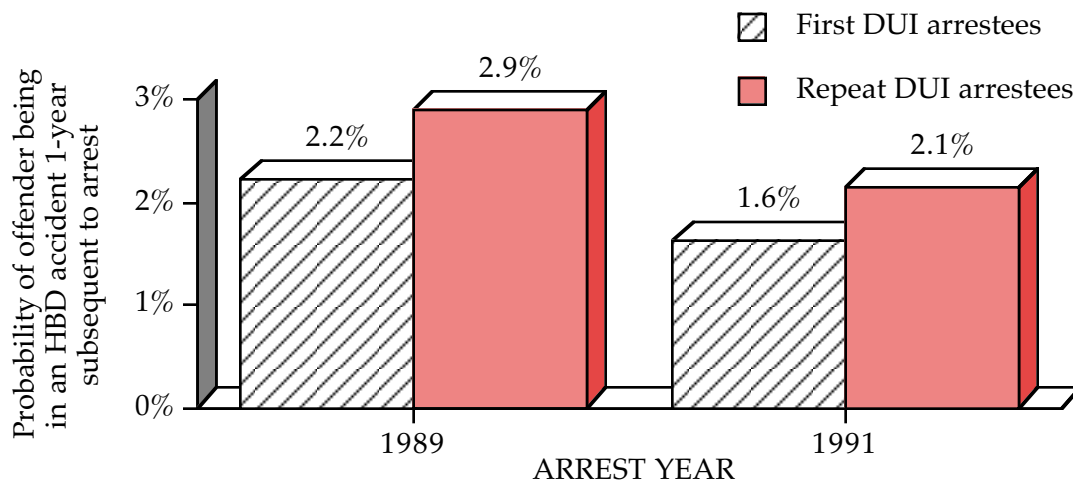


Figure 2. Adjusted probability of being in an HBD accident 1-year subsequent to DUI arrest, by offender group, and arrest year.

Subsequent DUI/Wet-Reckless Driving Convictions

- In both studies, first and repeat offenders arrested in the post-law period were significantly less likely to recidivate than were those arrested pre-APS. Among total arrested DUI offenders, first offenders from the post-law period were 21.1% less likely to receive subsequent DUI convictions than were those arrested pre-APS, and post-law repeat offenders were 19.5% less likely to recidivate than were repeat offenders arrested prior to the new laws. Among DUI convictees (from the second study), first offenders arrested after the new laws were implemented were 26.7% less likely to recidivate following their arrest than were first offenders convicted prior to the laws, and repeat offenders arrested in the post-law period were 25.2% less likely to recidivate following their arrest than were repeat offenders convicted prior to the new laws.
- As expected, relative to first offenders, repeat offenders were significantly more likely to recidivate within one year subsequent to their arrest.

Figure 3 shows the adjusted proportions of offenders who received a 1-year subsequent DUI or alcohol-related conviction for each offender group for the pre- and post-law years.

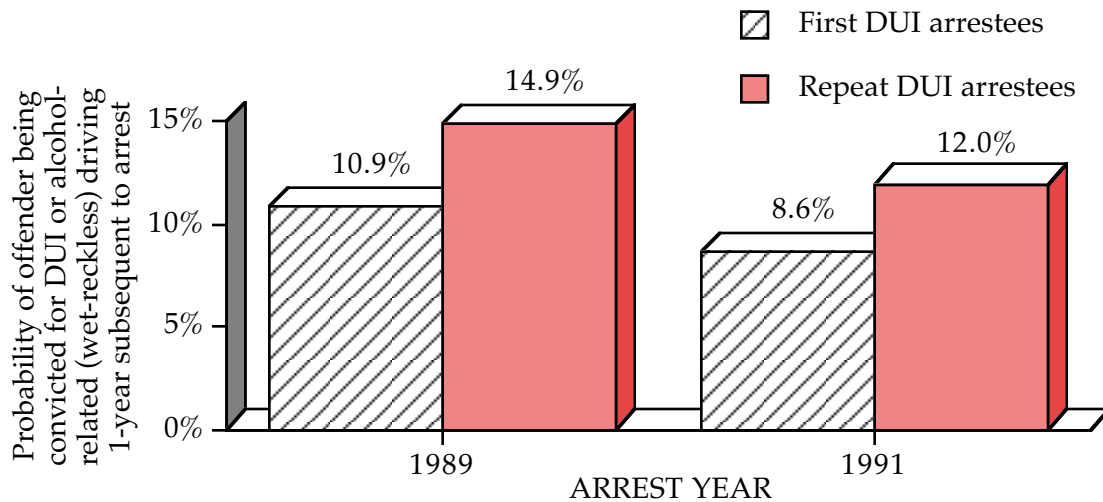


Figure 3. Adjusted probability of recidivating 1-year subsequent to DUI arrest, by offender group and arrest year.

Effects Associated with the APS Law

- A greater proportion of the significant effects found in this evaluation are attributable to the APS law than to the 0.08% law since APS imposed a suspension on almost all of the post-law offenders while proportionately few (only 3.7%) of the offenders had a BAC level between 0.08% and 0.99%. Roughly 94% of the accident and DUI incident reductions can therefore be attributed to the APS law.

Effects Associated with the 0.08% BAC Law

- The main safety contribution of the 0.08% law has been to more than triple the number of offenders with BAC levels between 0.08% and 0.099% who are convicted of DUI, and more than double the number of offenders in this BAC range who are convicted of wet-reckless driving. However, since these offenders only comprise a small proportion of all DUI offenders (only about 3.7%), the 0.08% law resulted in a very modest increase in the number of suspended drivers—about 3,300 per year.

Total Number of Accidents and DUI Events Prevented

- Based on the preceding evidence, it was estimated that the new laws produced the following public safety benefits in 1991:
 - 6,200 fewer subsequent total accidents;
 - 1,500 fewer HBD accidents;
 - 5,800 fewer DUI convictions.

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INTRODUCTION

Although California's driving-under-the-influence (DUI) laws have been strengthened over the last two decades, each year up to 30% of those arrested for DUI are not convicted of the offense (Tashima & Helander, 1996). Research (Helander, 1986; Tashima & Helander, 1992, 1994, 1995; Tashima, Marowitz, DeYoung & Helander, 1993) has consistently revealed DUI conviction rates and time lags between arrest and conviction which counter the perception of court-mediated DUI sanctions as being either "certain" or "swift." Tashima and Helander (1997) documented DUI conviction rates among California's larger counties ranging from 56.7% to 81.0% in 1994 (the most current year for which total conviction data are available). Their data revealed that California's largest county, Los Angeles, which accounted for over 25% of all DUI arrests in the state, had a DUI conviction rate of only 68.4%, and that the statewide average DUI conviction rate for 1994 was only somewhat higher at 70.6%, with an additional 8.9% convicted of alcohol-related or nonalcohol-related reckless driving for that year. Tashima and Helander (1996) also report a statewide average time lag of 2.8 months from DUI arrest to conviction and another 3.2 months from conviction to update of the Department of Motor Vehicles (DMV) driver record database. These time lags between arrest, conviction, and postconviction license actions cannot help but diminish any deterrent effect of DUI law. Administrative license suspension laws, also called "administrative per se" (APS) laws, were developed as a means of addressing these problems.

License suspension has long proven to be an effective traffic safety countermeasure by depriving offenders of their driving privilege, producing an effective "incapacitation" effect (McKnight & Voas, 1991). Furthermore, such action can easily be handled through administrative processes. Administrative license suspension operates swiftly and independently of the criminal justice system which, by design, often operates so slowly as to undermine its own punitive impact.

California became the 28th state to implement an APS law on July 1, 1990. Senate Bill (SB) 1623 (Lockyer) allowed arrested drunk drivers with a blood alcohol concentration (BAC) of 0.10% or greater (changed very shortly thereafter to 0.08% or greater with passage of SB 1150-Lockyer) to be suspended in a separate, more timely, civil action, independent of the adjudication of, and sanctions for, the criminal DUI charge. Implementation of the APS license suspension law (California Vehicle Code §13353 and §13353.2) imposed an immediate license action on the majority of DUI offenders, addressing both the deficiencies in speed and in probability of punishment under California's criminal DUI laws. Just six months prior to implementation of the APS law, in separate legislation (SB 408-Leonard), California reduced its "illegal per se" BAC level from 0.10% to 0.08%. This law had the effect of broadening the range of drivers subject to both APS suspension and court adjudication.

In Volume 1 of this report we showed that the APS and 0.08% laws, in combination, produced a modest general deterrent effect in the form of reductions in alcohol-related accidents among the general driving population. General deterrence refers to the suppression of proscribed behavior among potential offenders given the threat of punishment upon apprehension. The potential for achieving a general deterrent impact

is directly dependent upon the public's perception that there is a substantial risk of apprehension. Potential offenders are deterred even without having actually experienced the threatened punishment. Volume 1 showed stronger general deterrent effects associated with the implementation of the APS law, with significant declines of between 9% and 13% among alcohol-related accidents. The effective date of lowering the illegal per se limit to 0.08% BAC coincided with smaller, albeit significant, reductions on some alcohol surrogate accident measures, with no corroborating evidence of reductions among direct alcohol-related accident measures.

Specific, or "special," deterrence refers to the impact of the punishment experience on sensitizing convicted offenders to the threat of further punishment for committing a similar crime in the future (Ross, 1992). Such deterrence, like rehabilitation, is measured by diminished recidivism among offenders. While increases in punishment severity have little potential for impacting the general driving population since their punitive effects are not experienced by offenders who are not apprehended (Ross, 1992), they have generally had a greater specific deterrent impact on those who are apprehended. Specific deterrence in this study refers to the decline, if any, in the incidence of subsequent drunk driving among offenders following their arrest.

Effectiveness of License Suspension

Post-conviction license suspension has long been used in California as an important DUI countermeasure, particularly for repeat offenders. The sanction has historically either been imposed by court order or, more commonly, under mandatory action by DMV subsequent to a DUI conviction. There have been numerous studies demonstrating the effectiveness of license suspension in reducing subsequent convictions and accidents. These studies conclude that its greatest effect may be attributed to the reduced driving exposure of the suspended driver. They have demonstrated that license suspension, even when imposed by the court after the typical lengthy delay between arrest and conviction, is among the most effective countermeasures in reducing subsequent fatal, injury, and total accidents (Sadler & Perrine, 1984; Tashima & Peck, 1986; Tashima & Marelich, 1989; Sadler, Perrine & Peck, 1991).

Despite the fact that many suspended drivers continue to drive while suspended, there is consistent evidence provided by their improved subsequent driving histories that they either do so more carefully or drive less often (Knoebel & Ross, 1996; Ross & Gonzales, 1988; Sadler, Perrine & Peck, 1991; Wells-Parker & Cosby, 1988; Williams, Hagen and McConnell, 1984).

Ross (1992, 1995) argues that administrative license actions actually serve to incapacitate offenders as effectively as does criminal incarceration in its current form of administration. He advocates substituting administrative license actions for the current "jail" sentence typically imposed by the court for first offenders who have caused no physical harm. Tashima, Marowitz, DeYoung and Helander (1993) showed that when imposed in addition to jail and/or fine, such license actions following a DUI conviction have a greater traffic safety impact among DUI offenders than does imposition of jail and/or fine alone.

Williams, Hagen and McConnell (1984) speculated that while post-conviction license suspension is highly effective among repeat offenders, and might be equally effective among first-offenders, subjecting the large number of first offenders (making up approximately 68% of the DUI population) to court-ordered license suspension might cause an excessive increase in the request for trials by jury, and the incidence of plea bargaining. To date, less than 10% of California's first offenders receive a post-conviction suspension.

Administrative license actions circumvent many of the problems associated with post-conviction license actions cited by Williams et al. (1984) because the action is summarily imposed in a civil track separate from the criminal adjudication of the case. Since they require demonstrating only a "preponderance of evidence" common to civil actions, as opposed to "proof beyond a reasonable doubt" as in criminal prosecutions, APS laws are more consistently imposed, providing greater certainty of punishment.

Most of the research to date on the effectiveness of administrative license actions has focused on the general deterrent impact of the law, and there have been many such studies. The findings, for California summarized above and presented in detail in Volume 1 of this report, show a moderate general deterrent impact of the APS law. That there were significant effects is especially noteworthy given the fact that California has long employed post-conviction license suspension as a primary DUI sanction. Studies from other states have also generally found significant general deterrent effects of their administrative license suspension laws (Blomberg, Preusser, & Ulmer, 1987; Cleary & Rodgers, 1986; Lacey, Stewart, Marchetti, and Jones, 1990; McDonald et al., 1987; Muller, 1989; and Ross, 1991) and in studies comparing the general deterrent impact of various sanction options, administrative license actions have been shown to be superior in causing a general deterrent impact (Klein, 1989; Zador, Lund, Fields, & Weinberg, 1988).

In one of the few studies of the *specific* deterrent impact of pre-conviction administrative license suspension laws, Stewart, Gruenewald, and Roth (1989) used survival analysis techniques to demonstrate significant decreases in DUI recidivism rates among offenders in Louisiana and North Dakota following imposition of administrative license suspensions and decreased recidivism on *other* traffic offenses among offenders in Mississippi. Tashima and Helander (1997) also found larger reductions in subsequent total accidents among offenders subject to an APS suspension than among offenders arrested prior to the APS law, particularly among repeat offenders sentenced to participate in a second offender SB 38 alcohol treatment program (so named for the legislative bill which introduced the treatment programs).

The California APS License Suspension Law

To describe its provisions briefly, the California APS law requires the DMV to suspend or revoke the driving privilege of persons who are arrested for driving with a BAC of 0.08% or more or who refuse or fail to complete a BAC chemical test upon arrest. As noted, this administrative action requires no adjudication or conviction and is independent of any criminal penalties imposed in court upon conviction of the DUI offense. The offender's driver license is seized by the arresting officer upon arrest. Due process of law is allowed by the issuance of a 30-day (reduced from 45 days beginning

July 1, 1993 by AB 3580–Farr) temporary license intended to provide the driver with sufficient time to challenge the suspension through DMV administrative review.

Under California’s APS law, when a driver submits to and “fails” a BAC test and has no prior DUI or “wet-reckless¹” convictions (within seven years), a four-month license suspension is imposed. Following 30 days of “hard” suspension (and providing they first demonstrate proof of insurance, show proof of enrollment in an alcohol treatment program, and pay all penalty fees), the law provides for such drivers to obtain either a 60-day restricted license to drive to and from an alcohol treatment program, or (as of January 1, 1995, after the time period assessed in this evaluation) a 5-month restricted license which also allows driving to, from, and during the course of employment. A 1-year suspension is imposed on drivers having one or more prior DUI or wet-reckless convictions within seven years, with no provision for a restricted license. If an arrested DUI offender refuses a BAC test, the term of license action imposed is one year for a first offense, two years for a second offense, or three years for a third or subsequent offense (within seven years). There are no provisions for license restriction following a BAC test refusal.

To prevent undue hardship, a commercial driver (having no prior DUI or wet-reckless convictions) arrested in a noncommercial vehicle is allowed to drive to, from, and during the course of employment for a 4-month period following a 30-day “hard” suspension.

The 0.08% BAC Per Se Limit Law

Before the advent of chemical tests for alcohol, drunk driving was defined presumptively in terms of evidence of intoxication observable to a law enforcement officer. As BAC testing gained acceptance as an evidentiary tool, relatively high presumptive standards were established beyond which virtually any driver would clearly be considered to be impaired. Furthermore, as evidence on the relationship between lower BAC levels and driving impairment accumulated, many states lowered their presumptive BAC limits and some states began enacting per se thresholds. In 1982, California enacted a 0.10% BAC per se limit law (AB 7-Hart) while still maintaining a presumptive limit (reduced from 0.15% to 0.10%).

Then on January 1, 1990, just six months prior to the implementation of the APS law, California became only the fourth state (after Oregon, Utah, and Maine) to lower the illegal per se limit to 0.08% BAC. This lower limit was imposed as a result of the growing evidence from numerous studies that have shown impairment of driving related skills at BAC levels lower than the former 0.10% per se limit. A meta-analysis of studies evaluating the effects of alcohol on driving related tasks, by Moskowitz and Robinson (1988), found that most driving related tasks were impaired at BACs as low as 0.05%, and the majority of such skills were impaired before reaching 0.08%. The reader is referred to Cleary (1994) for a concise, comprehensive summary of the findings of that meta-analysis and other policy considerations concerning a reduced per se BAC limit.

¹ A wet-reckless conviction is a plea bargained reduction of a DUI arrest. However, it serves as a prior for the purposes of post-conviction sentencing upon any subsequent DUI conviction and for the purposes of determining the terms of administrative license suspension upon a subsequent DUI arrest.

In this volume we will attempt to quantify the extent to which the immediate administrative *pre-conviction* license suspension actions may have produced a specific deterrent effect in the presence of the reduced BAC per se limit. Three indices of recidivism will be considered: 1-year subsequent total accidents, 1-year subsequent alcohol-involved accidents (often referred to as “had-been-drinking” or HBD accidents), and 1-year subsequent DUI or alcohol-related “wet-reckless” driving convictions. For these assessments, offenders will be categorized into two groups formed on the basis of their prior conviction history. The groups will consist of those arrestees having no prior DUI or wet-reckless convictions and those with at least one DUI or wet-reckless conviction prior to the entering arrest. If, in fact an APS suspension has a significant deterrent effect on those who are arrested for DUI, one would expect to find a lower rate of subsequent accidents and DUI offenses among post-APS DUI offenders than among pre-APS offenders. It is also conceivable that any such effect might be larger for repeat offenders because of the greater length of the repeat offender suspension.

This study consists of two evaluations. In the first evaluation we will compare the effects for all offenders arrested during a 1-year period prior to the 0.08% and APS laws to all offenders arrested during a 1-year period subsequent to the new laws. Offenders in each of these groups were not necessarily convicted of the DUI offense which led to their arrest. The second evaluation will compare sample groups of offenders each of whom were convicted of DUI or alcohol-related reckless driving during a 4-month period either prior to or after the new laws were implemented.

Although the present study is primarily an evaluation of the APS law rather than an assessment of the impact of the 0.08% BAC limit, it is possible to estimate the contribution of the 0.08% BAC law to any deterrent effect which the administrative suspension has on arrested offenders. Any such contribution of the 0.08% BAC law would be manifest by the additional number of offenders who were suspended by reducing the permissible BAC limit from 0.10% to 0.08%. This relationship will be used in the present study to produce an estimate of the 0.08% law’s contribution to the specific deterrent effect of the administrative license suspension.

METHOD

The evaluation was performed as two studies. The first study assessed the subsequent driving records of offenders arrested but not necessarily convicted of their offense and the second study was limited to a sample of offenders each of whom was convicted of either DUI or alcohol-related reckless driving.

Study 1: Evaluation of Arrested DUI Offenders

Subjects in the first evaluation were identified from data collected annually by the Department of Justice (DOJ), Law Enforcement Information Center, Monthly Arrest and Citation Register (MACR) system. Specifically, the subjects were identified from among individuals arrested for DUI either in 1989, before APS was implemented, or in 1991, six months after the law’s implementation. For each group, arrested drivers were included in the evaluation if they had a California driver license number that could be

identified on the California DMV driver record database. Drivers licensed out-of-state, assigned an X-prefixed license number (no record of ever having a California driver license), or who had not even an X-file record, were excluded since the DMV would not have a complete record of their driving histories. Drivers with “invalid” licenses resulting from suspension or revocation were included since there would be a complete record of their in-state driving record, regardless of their current license status. An X-prefixed license number is assigned when a driving infraction is reported identifying a driver for whom no driver license record can be found. Individuals assigned these numbers were removed from the evaluation since there is no way of reliably tracking the history of such a driver and consequently they would have incomplete and perhaps duplicated driving histories on file. X-prefixed records account for approximately 10% of the DMV driver record database and their elimination reduced the DOJ study file by 7.8%. Records indicating that the action had been dismissed or found to be unconstitutional were also removed from the files. Such records accounted for less than 0.05% of the total records.

This study employed a 2 x 2 factorial design and used logistic regression to analyze the statistical significance of any differences between the main and interactive effects of the laws and between first or repeat offender status on the odds of being involved in a subsequent accident or DUI related incident within a 1-year follow-up period. The first factor in the design consisted of the two time periods establishing the pre-law versus post-law comparison. The second factor consisted of the two major categories used in assigning suspension length to offenders in accordance with the APS law. The two levels of this factor consisted of those offenders having no prior DUI or wet-reckless convictions within the previous seven years before their study-period arrest date, and those having one or more prior DUI or wet-reckless convictions within the prior seven years of their entering arrest.

In this first study, the offenders were included regardless of whether they were actually convicted of the arrest which led to their inclusion in the study. That is, they may or may not have been convicted of either DUI or the lesser plea bargained charge of wet-reckless driving as a result of the current arrest. Although data were not available to obtain exact counts, it was determined that a minimum of at least 21% of the offenders in Study 1 were not convicted subsequent to their group-qualifying arrest and an additional 8% received at most only a wet-reckless conviction. In Study 2, only the categories of offenders convicted of the DUI for which they were charged were available since non-convictions and prior alcohol-reckless convictions were not indicated on the original data file.

Study 2: Evaluation of Convicted DUI Offenders

The arrest data provided by the Department of Justice, and evaluated in Study 1, allowed the assessment of each driver’s subsequent recidivism beginning from the day after the driver was arrested. This is the best date to begin the recidivism tracking since the order of suspension is issued at the time of arrest (although the suspension doesn’t actually begin for 30 days after arrest). However, a limitation of using this data was that the oldest DOJ data available for the study dated back only to arrests made in 1989, just one year immediately prior to introduction of the new laws. This does not allow a complete “APS-free” comparison year of follow-up actions for all subjects in what

should ideally be the “pre-law” comparison group. The follow-up period for the comparison group was actually potentially affected by the possible *general* deterrent impact of the APS law itself. Therefore, the post-treatment contingencies under which both groups operated were actually the same for at least some of the offenders in both pre- and post-law periods. While some might argue that such comparability in the follow-up period is desirable, the intent here was to observe the differences between groups that were free of any general deterrent effects of the APS law during the follow-up period in order to obtain a better measure of the net impact of the law. Consequently, to obtain such a comparison, a second evaluation was performed which compared the subsequent recidivism rates of a sample of offenders who were arrested during 1986 or 1987 and convicted in 1987 (a period two to three years prior to the introduction of the laws) to those of a sample of offenders arrested during 1991 or 1992 and convicted in 1992. In this second evaluation, all of the chosen subjects had been convicted of DUI associated with an arrest that occurred within the study time period.

The offenders in this second study were identified from monthly abstract update tapes which contain all DUI conviction data reported to DMV by the courts. Such offenders are statutorily defined and sanctioned as DUI offenders. The design used in this evaluation was identical to that of the first evaluation, with two exceptions. The first difference is the one just mentioned, whereby these subjects were all convicted of a DUI offense, while offenders in the DOJ files were arrested but not necessarily convicted. The second difference was that this assessment compared substantially fewer cases since the data were comprised of convictions accumulated over only 4-month intervals. The pre-APS comparison condition consisted of DUI convictions adjudicated between June and September 1987, and the post-APS condition included DUI convictions adjudicated during the same four months of 1992. Like the first evaluation, this assessment employed a 2 x 2 factorial design and used logistic regression to analyze the statistical significance of any differences between the main and interactive effects of the laws and first or repeat offender status on the odds of being involved in a subsequent accident or DUI-related incident within a 1-year follow-up period.

As in the evaluation of DOJ-provided data described above for Study 1, this second evaluation included drivers only if they had a California driver license number identified on the California DMV driver record database. Drivers licensed out-of-state or assigned an X-prefixed license number were excluded since the DMV would not have a complete record of their driving histories, while drivers with “invalid” licenses resulting from suspension or revocation were included since they would have a complete in-state driving record available on the database regardless of their current license status.

In both studies, this particular grouping strategy which resulted in comparing first to repeat offenders was used because the APS suspension length increases from 4 months for first offenders (with provisions for a restricted license after 30 days “hard”-suspension) to 1 year for repeat offenders (with no provision for a restricted license). Subjects who refuse a test of BAC receive license actions ranging from a 1-year suspension for a first offense to a 3-year revocation for a third or subsequent offense. Test-refusers could not be identified accurately in the pre-APS period of either evaluation, so refusers were not grouped separately for the purposes of this study.

Furthermore, in any given year, they only account for between 6% to 7% of the DUI population and were therefore considered unlikely to significantly affect the groups.

Court criteria considered in determining an offender's status and associated post-conviction sanctions differ from those used in assigning an APS suspension length. By court criteria, offenders are considered "nonconvictes" if they were not convicted of DUI for the entering arrest, even if they were convicted of alcohol-related reckless driving as a result of a plea-bargain. The post-conviction sanctions associated with such a conviction are far less punitive than those which accompany a DUI conviction. The lesser reckless-driving sanctions consist of a fine of no less than \$145 and no more than \$1,000, and/or a jail term of no less than five days and no more than 90 days—usually served performing community service rather than in actual confinement. There is also no requirement to complete an alcohol treatment program.

Under the statutes of the APS law, except for the small proportion of those actually found "not guilty" by the court (about 2% of the cases), the post-APS offenders in each of the study groups would generally have received the administrative suspension regardless of the outcome associated with the court actions in the case. DUI arrestees are issued the APS suspension even if they accept a plea-bargain to the lesser wet-reckless conviction. Furthermore, a prior wet-reckless conviction is statutorily considered a prior offense for the purposes of determining the appropriate term for the APS suspension. Consequently, in Study 1, arrestees would be included and grouped as first offenders if, having no prior DUI or wet-reckless convictions, they were convicted of wet-reckless driving as a result of their respective "group-qualifying" arrest. Likewise, an individual who had no prior DUI convictions, but who had one or more prior wet-reckless convictions within the preceding seven years would have been included and grouped with repeat offenders in Study 1. Since Study 2 data were limited to DUI convictes, in that study, individuals who had been arrested during the group-qualifying period and subsequently convicted for wet-reckless driving were not available.

Dependent Measures

The dependent outcome measures that were used as indices of recidivism in both studies consisted of 1-year subsequent total accidents, 1-year subsequent HBD accidents, and 1-year subsequent DUI or DUI-related "wet-reckless" convictions. All of the outcome measures were obtained from the DMV master file through a data extraction program. The data were extracted 20 months subsequent to the last possible arrest date for each year of the study. More specifically, data from the 1989, pre-APS, driver records were extracted at the beginning of September 1991 and data from the 1991, post-APS, subjects was extracted at the end of August 1993. The extra time beyond the one year follow-up served as a buffer period and was necessary to obtain a complete record of incidents that would otherwise be missed due to time lags between violation or accident dates and entry of the data into the DMV master file.

Offenders were included in the pre-APS comparison group in Study 1 if they had a DOJ-reported DUI arrest which occurred sometime during 1989. Offenders were included in the post-APS group if they had a DOJ-reported DUI arrest which occurred sometime during 1991, the first full calendar year for which APS suspensions were issued.

Subject's records would be assessed more than once within either file or in both files if the driver had multiple violations within or across the time periods. If a driver was assessed more than once, their offender-group status could change from first to repeat offender status.

Prior History and Covariate Evaluation

The study design made it necessary to address the possibility that offenders in the two study periods (the pre- and post-APS periods) might not be comparable with regard to their prior driving histories and personal characteristics. If left unchecked, such differences could bias the study results. Consequently, as an initial test, one-way analysis of variance was used to detect evidence of pre-existing differences on 21 biographical and prior driving history variables between offenders in the pre- and post-APS years. The purpose of these tests was to obtain some idea as to the magnitude and structure of the group differences and to assist in identifying which of these variables should be considered as potential covariates. With one exception, all of the one-way analyses were significant ($p < .01$). The single exception was for the analysis of 7-year prior felony DUI convictions which showed no significant differences between the two years assessed, probably due to the rarity of the events. Consequently the variable was dropped from further analyses.

Pearson product-moment correlations revealed that several of the potential biographical and prior driving history covariates were at least moderately intercorrelated ($r > .60$). For those variables showing some degree of intercorrelation, only one of the two intercorrelated covariates was selected for further analysis and the other was dropped in an effort to avoid subsequent problems with multicollinearity. From among the sets of intercorrelated variables, those dropped were ones that represented a subset of a larger category that was already represented. For example, the subset 2-year prior *nighttime* fatal and injury accidents was dropped in favor of retaining the more inclusive category of 2-year prior *total* fatal and injury accidents.

From these tests eleven of the biographical and prior driving record variables were identified as potentially significant, relatively independent, covariates. The potential covariates were: driver's age at the time of arrest, driver's gender, class of driver license, 2-year-prior driving record variables consisting of number of major convictions (2-point violations²), number of minor convictions (0- or 1-point violations), total accidents, number of severe (fatal or injury) accidents, number of convictions for driving while suspended or revoked, and three regional demographic or geographic indices obtained for each driver's ZIP Code to control for regional variations in enforcement levels and accident rates. The three variables obtained by ZIP Code were 3-year average total accidents, 3-year average major convictions, and 3-year average moving violations, for each ZIP Code in California. While these ZIP Code measures were considered for inclusion in the models obtained in the initial logistic regression analyses and have proven to be useful covariates in past studies of this type, they

² Traffic convictions of serious offenses such as DUI, hit and run, or reckless driving are considered 2-point violations under the California negligent-operator treatment system (NOTS) program. Minor traffic violations, such as speeding convictions, are assigned one point. The NOTS program is designed to alert the department and to suspend the driver's license when the driver's point count equals or exceeds 4 points in 12 months, 6 points in 24 months, or 8 points in 36 months. For the purposes of this evaluation, convictions considered "major" convictions were those assigned a 2-point count and those considered "minor" convictions were those assigned no points or a 1-point count by the NOTS program.

exhibited problems of multicollinearity (as evidenced by high standard errors and parameter estimates in these analyses) and were therefore dropped from the final models.

Even in the event that the potential prior record variables did not interact with the different groups or between the two years of the study, their inclusion in the logistic regression analysis is warranted because they serve to reduce the error variance that might otherwise impede the ability to detect the impact of the offender-group or arrest-year variables of interest. If a significant effect of the independent variables is obtained from among the variance left unexplained by the prior-record variables, we can have greater confidence that the results are attributable to the independent variables than if the covariates had not been included.

Design and Statistical Analysis

As noted above, a quasi-experimental logistic regression model was used to assess the possible specific deterrent impact of the APS and 0.08% BAC-limit laws on the subsequent driver records of the 1991 offenders in Study 1 and 1992 convictees in Study 2, compared to the pre-law subsequent driver records of either the 1989 or 1987 offenders, respectively. As applied here, logistic regression predicts the likelihood that subjects will reoffend during the 1-year following their arrest. The technique defines the outcome as a binary measure which differentiates whether or not there was one or more accidents or DUI events occurring in the subsequent year. A hierarchical approach was used to enable assessment of the pre- versus post-year and offender status variates as independent variables rather than as covariates. This hierarchical approach produces results for categorical data that are somewhat analogous to those resulting from an analysis of covariance. The studies were structured as 2 x 2 factorial designs. In the first study, the two factors were the year of DUI arrest (pre- versus post-APS years) and DUI arrest status (first versus repeat arrests) regardless of conviction status. The second study was similarly structured but the factors were pre- versus post-APS years and 1 or 2+ DUI convictions. This hierarchical design was employed because the focus of the evaluation was on the main effect of year (adjusted for any background covariates) and whether the effect of year varied as a function of offender status (year by offender status interaction).

In each analysis, the covariates were brought into the prediction equation as a group. The covariates were centered before entering them in the analyses to prevent problems of multicollinearity. Predictors were entered in the analyses using a forward-selection, sequential approach and the criterion to include a covariate or factor was set to a significance level of 1.0 so as to force all of the variables into the equations. In each preliminary analysis, the block of covariates was entered first, followed by the offender group independent variable (first versus repeat), the covariate x offender group interactions, the arrest-year independent variable (pre- versus post-APS law), and finally the arrest-year x offender group interactions. Prior driver record and background covariates which were not significant predictors in the presence of all other predictors, as evidenced by nonsignificant Wald chi-square probabilities ($p > .05$), were eliminated and the remaining predictors were reanalyzed.

Significant interactions between any of the background covariates with either of the independent variables were included in subsequent stages of the logistic regression modeling process only if they were of a sufficient magnitude as to contribute substantially to the independent variable effects. Consequently, any interactions between the covariates and the effects of year or offender status with an effect magnitude of less than 25% of the main effect size, revealed in the initial logistic regression analyses, were excluded from further analyses. The final logistic regression analyses were then performed incorporating all of the significant covariates and substantive interactions along with the independent variables. The independent variables (year and offender status) were always included in the analyses regardless of their magnitude since they were the variables of primary interest.

In both studies, separate analyses were performed for each of the three post-arrest recidivism measures. These dependent measures were: 1-year subsequent total accidents, 1-year subsequent HBD accidents, and 1-year subsequent DUI and alcohol-related reckless driving convictions. HBD accidents represent a police-designated category of accidents for which the reporting officer indicated that one or more of the involved drivers “had been drinking.”

Probabilities of recidivism were estimated using the resulting logistic regression model estimates. The goal is to find the best linear combination of predictors to maximize the likelihood of obtaining the observed outcome. The logistic prediction model may be presented as:

$$\text{logit}(p) = \log(p \div 1 - p) = \alpha + B'x,$$

where p = the probability of recidivating, α = the slope intercept, and B' = the vector of slope parameters or weights. Where this would be the final outcome using multiple regression, with logistic regression we can proceed by determining the odds of reoffense associated with membership in each offender group and by arrest year. The antilogged value of p for each combination of offending condition (each cell in the 2 x 2 matrix of offense-group x arrest-year categories) is then solved by the equation:

$$p = e^{\text{logit}(p)} \div (1 + e^{\text{logit}(p)})$$

This equation estimates the natural log of the probability of, say, reoffending in one group divided by the probability of reoffending in the other group. This resulting p value is the predicted probability that individuals in a particular group are going to recidivate. These predictor estimates take the form of odds ratios. These ratios determine the likelihood of reoffense, given membership in a particular group or, in case of interactions, combination of groups. If the APS law was effective in deterring accidents or DUI offenses, the regression coefficient for years would be significantly different from 0 and the relative risk (odds ratio) would diverge from 1.0. A relative risk or odds ratio of 1.0 for the year variable would indicate that the pre- and post-law offenders had identical probability of reoffending. The interaction term, year x offender status, provides a measure of whether the effects of year and offender status are additive within the context of the multiplicative logistic regression model. In this context, a significant interaction would indicate that the effect of the APS law differs as a function of offender status.

All of the logistic regression analyses were performed using the 'LOGISTIC' procedure module from the SAS computer software package (SAS Institute Inc., 1990). Within the program, the variables were defined as 'descending' in order to reverse the LOGISTIC routine to solve for the likelihood of a subsequent occurrence of one of the outcome measures rather than for the likelihood of the event *not* reoccurring. The BMDP (Dixon, 1981) software package was used to obtain chi-square estimates to determine if the likelihood of reoffending in each arrest-year significantly varied between offender groups. This is comparable to conducting simple effects tests subsequent to an analysis of variance. Chi-square tests were appropriate here since the group data were categorical in nature.

Odds ratios were calculated to represent the relative risk associated with each variable relative to the level which was selected as the reference or standard level. Here, for the offender status variable, the group of offenders having no prior DUI convictions who would have received a first offender APS suspension under the provisions of APS served as the reference group for those having prior convictions who would receive repeat offender suspension lengths under the provisions of APS. Analysis of the arrest year variable used the post-APS (1991) year as the standard to which the pre-law period was compared. The odds ratios were used to calculate the likelihood of a subsequent accident or reoffense for offenders in each year (pre- versus post-law) and for each level of offender status (first versus repeat offense).

RESULTS

Process Measures

Summary reports on *Administrative Per Se Process Measures* (presented in Volume 1) document the APS license suspension/revocation totals to date. These reports show that in the first five years of the law, over 1 million APS actions were taken (excluding actions later set aside). Table 1 presents the total actions taken by year and offender status.

Table 1
Administrative Per Se (APS) Actions Taken by Year by Offender Status^a

Offender status	BAC test	Year					
		1990/91	1991/92	1992/93	1993/94 ^b	1994/95	1995/96
Total APS offenders		275,786	249,823	218,943	197,191	171,502	190,566
No prior DUI convictions	Completed	179,757	162,015	142,753	125,620	107,838	122,579
	Refused	11,101	10,068	8,999	7,546	6,525	7,063
Prior DUI convictions	Completed	74,404	68,136	59,355	53,025	42,373	46,704
	Refused	10,524	9,604	7,836	6,806	5,253	5,532

^aFigures exclude actions later set aside.

^bIn January 1994 California implemented a "zero tolerance" .01% BAC per se limit for drivers under age 21 carrying an administrative license suspension for violators. In 1993/94 there were 4,194 such suspensions, in 1994/95 there were 9,511 such suspensions, and in 1995/96 there were 8,688 such suspensions which are included in the total offender counts.

These figures reflect a drop in APS suspensions/revocations of 9.4% from the first to the second year, 12.4% from the second to the third year, 9.9% from the third to the fourth year, 13.0% from the fourth to the fifth year, and an increase of 11.1% from the fifth to the sixth year. This pattern is generally consistent with the overall DUI arrest rates as reported by the Department of Justice, with the exception of the rise in the most recent fiscal year data (as of this writing 1996 calendar year DOJ DUI arrest data were not yet available to confirm this reversal in trend).

During the first year of APS, only 4.4% of eligible first offenders opted to participate in an alcohol treatment program—which qualified them for a restricted license to drive to and from the program—and only 3.6% of such offenders chose to participate in such programs during the second year. In the third year, participants rose to 3.8% of eligible first offenders and rose again to 4.5% in the fourth year. On January 1, 1995, midway through the fifth year of the law, new legislation (SB 1758-Kopp) expanded the restriction to allow driving to and from and during the course of employment, with an increased restriction length of five months following the initial 30 day “hard” suspension. Consequently, in 1994/1995, 8.3% of eligible first offenders opted to participate in an alcohol treatment program and receive a restricted license, and that percentage increased to 10.3% in 1995/96.

Between 1990 and mid-1993, the average time lag between a DUI arrest and the effective date of the APS license action ranged from a high of about 50 days in 1990 to a low of 41 days in 1993. As a result of Assembly Bill 3580 (Farr), effective July 1, 1993, the time allowed to challenge the APS action under due process was reduced from 45 to 30 days. Subsequently, beginning in July 1993, the average time lag between arrest and the effective date of the APS suspension or revocation dropped to just under 33 days. Compared with the pre-APS time lag of 5.5 months between a DUI arrest and post-conviction license action, this represents a substantial increase in the “swiftness” of punishment for DUI offenders.

Table 2 summarizes annual departmental administrative hearing activity regarding APS. It shows that for each of the years that the law has been in effect, the great majority of offenders do not request a hearing, and that when hearings are requested the suspension action is usually upheld. With the exception of the most recent fiscal year, these data also show a trend toward increases in the rate of hearing requests and decreases in the proportion of sustained actions.

Table 2
 Administrative Per Se Departmental Hearings and Percentage of
 Total Administrative Per Se Actions by Year

Type of APS hearing	Year					
	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Total hearings held	20,165	20,413	20,587	21,264	19,188	16,023
% of total APS actions	7.0%	8.6%	8.9%	10.1%	10.4%	7.8%
Total BAC hearings	17,285	17,440	17,875	19,004	17,341	14,496
% total BAC APS actions	6.5%	7.2%	9.2%	9.7%	10.0%	7.6%
Total BAC hearings upheld	15,212	15,374	14,700	13,723	14,065	11,033
% of total BAC hearings upheld	88.0%	88.2%	82.2%	72.2%	81.1%	76.1%
Total BAC refusal hearings	2,880	2,973	2,712	2,260	1,847	1,527
% total BAC-refusal APS actions	13.0%	14.5%	15.5%	14.9%	14.5%	11.4%
Total BAC refusal hearings upheld	2,424	2,444	2,220	1,758	1,335	1,118
% of refusal hearings upheld	84.2%	82.2%	81.9%	77.8%	72.3%	73.2%

Study 1 Findings

Group Characteristics

After removing APS actions which were dismissed or unmatched to a California driver record, there were a total of 489,094 DUI arrests represented in the DOJ data file. Of those, 253,083 occurred in 1989, prior to the new laws, and the remaining 236,011 arrests were made in 1991, after the new laws.

After matching the post-APS arrestees with their driver records, it was found that 228,633 (or 97% of the 1991 arrestees) could be identified as actually having received an APS action. However, to maintain comparability across years, all of the arrestees were included (even those identified in the post-law period as not having received an APS suspension) since it was not possible to identify the individuals in the pre-law period who would have been eligible for an APS action.

Table 3 presents the number of arrests by offender group and arrest year represented in the DOJ data file.

The offenders' mean age across both years of this arrest file was 32.6 years old and was almost identical for both years. Males arrested for DUI outnumbered females by over seven to one (male percentage 1989 = 87.9%; male percentage 1991 = 86.9%).

Table 3

DOJ Reported DUI Arrests by Offender Group
and Arrest Year for 1989 and 1991

Arrest year	First DUI arrestees	Repeat DUI arrestees
1989		
Total	172,573	80,510
%	68.2%	31.8%
1991		
Total	165,309	70,702
%	70.0%	30.0%

Logistic Regression Models for Arrested DUI Offenders

In Study 1 the initial logistic regression analyses produced evidence of several significant ($p < .05$) covariate by offender group or covariate by year interactions. These significant interactions indicated that the relationship between the covariates and the outcome measure varied across offender groups or between years. The covariate by offender group interactions were therefore assessed in subsequent analyses to determine the magnitude of the interactions. In each instance, where a significant covariate by independent variable (offender group or year) interaction was identified, it was also found that the interaction was only 0.02% to 22.0% as large as the magnitude of the main effect of offender group or year (chi-squares were divided by their respective degrees of freedom to provide an approximate measure of effect size). Given the modest relative size of the interactions and the large number of interaction hypotheses tested, it was decided not to include any covariate \times factor interaction terms in the model. Any distortion introduced by violation of the homogeneity of covariate slopes assumption, under these conditions, would be negligible.

Subsequent Total Accidents Among Arrested Offenders

The final logistic regression analysis results are presented in Table 4. This analysis revealed no evidence of either significant ($p < .05$) covariate by offender group interactions or covariate by arrest year interactions. In this table, and in each subsequent table for which age was included in the analysis as a covariate, the odds ratio for the age covariate has been adjusted to reflect changes in relative risk given age increments of 10-year intervals. Therefore, in Table 4, for every increase of 10 years in age, the risk of a subsequent accident increases by 0.917 times.

Table 4

Logistic Regression Model Predicting 1-Year Subsequent Total
Accidents for DUI Offenders Arrested in Either 1989 or 1991

Predictor variable	Wald chi-square	<i>p</i> > chi-square	Regression estimates	Odds ratios <u>1989</u> 1991
Intercept	83322.4157	.0001	-2.8537	
Covariate block				
Age (x10)	213.7206	.0001	-0.00871	0.917
License class	75.9103	.0001	-0.2518	0.777
2-yr prior minor convictions	1168.4494	.0001	0.1166	1.124
2-yr prior total accidents	159.6934	.0001	0.1482	1.160
2-yr prior fatal and injury accidents	91.0199	.0001	-0.1878	0.829
2-yr prior license suspension violation convictions	97.7158	.0001	-0.0994	0.905
Offender group (first offender = 0)	143.0705	.0001	-0.1577	0.854
Arrest year (1991 = 0)	1351.2172	.0001	0.4332	1.542

Proper interpretation of odds ratios and regression coefficients for offender group and arrest year requires knowledge of the category which serves as the reference group, which are coded "0" in Table 4 and in subsequent tables. The SAS computer routine that was used in the analyses provides regression estimates for the likelihood of an offender incurring a subsequent incident. Consequently, it was logical to assign the highest code (in this case "1") to the dependent variable if a subsequent incident did occur. Furthermore, to establish a logical positive relationship between the dependent and independent variables, the independent variable condition that was expected to have the highest values were assigned the highest code. The post-law year of the independent variable "year" was assigned the lowest code since post-law accidents and DUI convictions were expected to decline from the pre-law period. That is, the post-APS year was used as the "norm" or referent in each analysis. However, the objective of the study was to determine the extent to which the laws affected subsequent accidents or recidivism relative to the pre-law period. Consequently, to frame the results in terms of the post-year period, in this and in all subsequent analyses, it is necessary to calculate the inverse of the arrest-year variable ratio obtained from the analyses.

The odds ratio obtained from the final logistic regression analysis indicates that, across offender groups, the odds of being involved in an accident within 1-year subsequent to arrest were 1.542 times greater among drivers arrested for DUI in the pre-law period (1989) than they were for those arrested in the post-law period (1991). Taking the inverse of the odds ratio ($1/1.542 = 0.65$) we can determine that the odds of 1991 DUI offenders being in an accident were only 0.65 times those of 1989 offenders. Because the resulting ratio is less than 1, it indicates that there was a reduction from the pre-law

period. This equates to the odds of post-law offenders being in a subsequent accident as 35% less ($1 - 0.65 \times 100 = 35$) than those of offenders arrested in the pre-law period.

The regression model shows that the odds of a repeat offender being in an accident 1-year subsequent to arrest were only 0.854 times that of the odds of a first offender (the reference group) being in an accident. That is, repeat offenders were actually *less* likely to be in an accident than were first offenders since the odds ratio is less than one.

Figure 1 shows the adjusted recidivism rates obtained from the logistic regression analyses for each of the offender groups for both pre- and post-APS years. They are shown as the adjusted proportion of 1-year subsequent total accident-involved drivers.

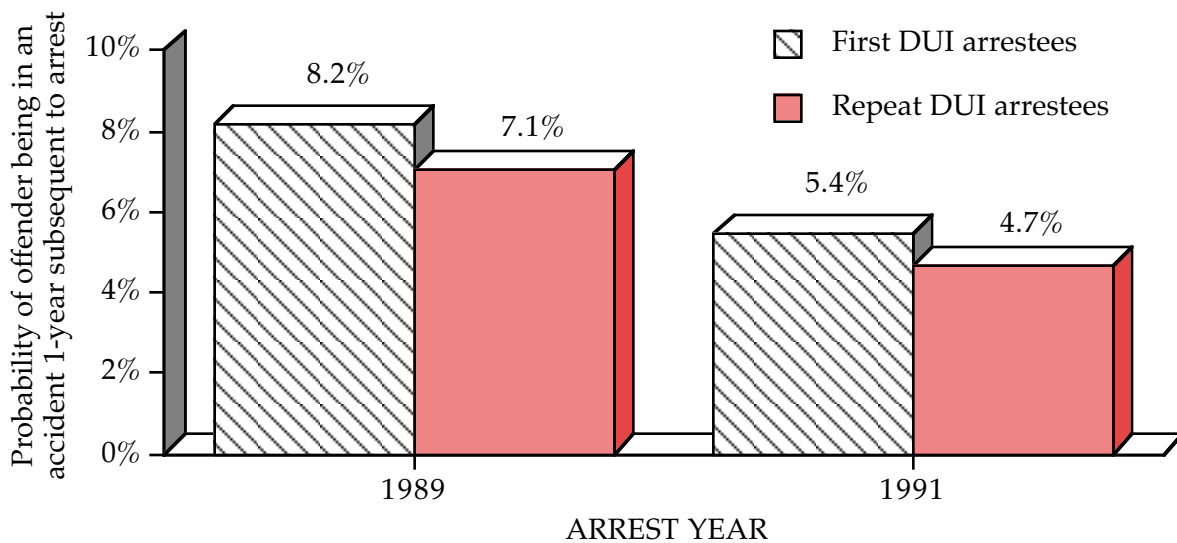


Figure 1. Adjusted probability of being in an accident 1-year subsequent to DUI arrest, by offender group and arrest year.

The probabilities reported in this figure were derived by applying the formula presented on page 18, which solves for p using the regression estimates obtained in the logistic regression analysis. This figure shows the lower proportion of accidents among repeat offenders in the one year period following their arrest than occurred among first offenders. Proportionate changes calculated using the probabilities presented for each group of offenders between years show that first offenders who were arrested in 1991, post-APS, were 34.1% less likely to be involved in a subsequent accident than were those arrested in 1989, prior to the 0.08% BAC and APS laws ($[8.2\% - 5.4\%] \div 8.2\%$). Repeat offenders arrested in 1991 were 33.8% less likely to be involved in a subsequent accident than were those arrested in 1989 ($[7.1\% - 4.7\%] \div 7.1\%$). Simple effects tests showed that the decreases were statistically significant ($X^2 = 976.035, df = 1, p < .0001$ and $X^2 = 375.782, df = 1, p < .0001$ respectively, for first and repeat offenders).

There were no statistically significant interactions between the effects of arrest year and offender group. The absence of a significant interaction between year and offender

status is noteworthy since it indicates that the effects of the APS law did not vary as a function of whether the offender was a first or repeat offender.

Subsequent Alcohol-Related (HBD) Accidents Among Arrested Offenders

As in the analysis of total accidents, the analysis of alcohol-related (HBD) accidents revealed no evidence of either significant ($p < .05$) covariate by offender group, or covariate by arrest year, interactions. The final logistic regression analysis results are presented in Table 5.

Table 5

Logistic Regression Model Predicting 1-Year Subsequent Alcohol-Related (HBD) Accidents for DUI Offenders Arrested in Either 1989 or 1991

Predictor variable	Wald chi-square	$p >$ chi- square	Regression estimates	Odds ratios <u>1989</u> <u>1991</u>
Intercept	56850.3710	.0001	-4.0955	
Covariate block				
Age (x10)	70.1053	.0001	-0.00859	0.918
Gender	43.1642	.0001	-0.2183	0.804
License class	6.6409	.0100	0.1505	1.162
2-yr prior minor convictions	91.9073	.0001	0.0584	1.060
2-yr prior total accidents	69.8390	.0001	0.1654	1.180
2-yr prior fatal and injury accidents	52.0536	.0001	-0.2451	0.783
2-yr prior license suspension violation convictions	12.5459	.0004	0.0511	1.052
Offender group (first offender = 0)	173.3526	.0001	0.2774	1.320
Arrest year (1991 = 0)	240.0910	.0001	0.3108	1.365

Again, calculating the inverse of the odds ratios obtained in this analysis, it was determined that across offender groups, the odds of drivers who were arrested for DUI in 1991 being involved in an HBD accident 1-year subsequent to their arrest were only 0.73 times ($1 \div 1.365 = 0.73$) those of 1989 DUI offenders. This equates to the odds of post-law offenders incurring a subsequent HBD accident being 27% less ($1 - 0.73 \times 100 = 27$) than those of offenders arrested in the pre-law period. Across years, the odds of a repeat offender incurring a subsequent HBD accident were 1.320 times greater than those of a first offender. Recall that on total accidents, the odds of repeat offenders being in a subsequent accident relative to first offenders was in the opposite direction as shown here for HBD accidents. Thus, the number of DUI convictions is directly correlated with the number of subsequent HBD accidents, while inversely correlated with the number of total subsequent accidents. This reversal in type of accident relationships is consistent with previous California studies (see for instance Tashima & Peck, 1986).

Figure 2 displays the adjusted proportion of 1-year-subsequent HBD accident-involved drivers for both offender groups for both pre- and post-APS years.

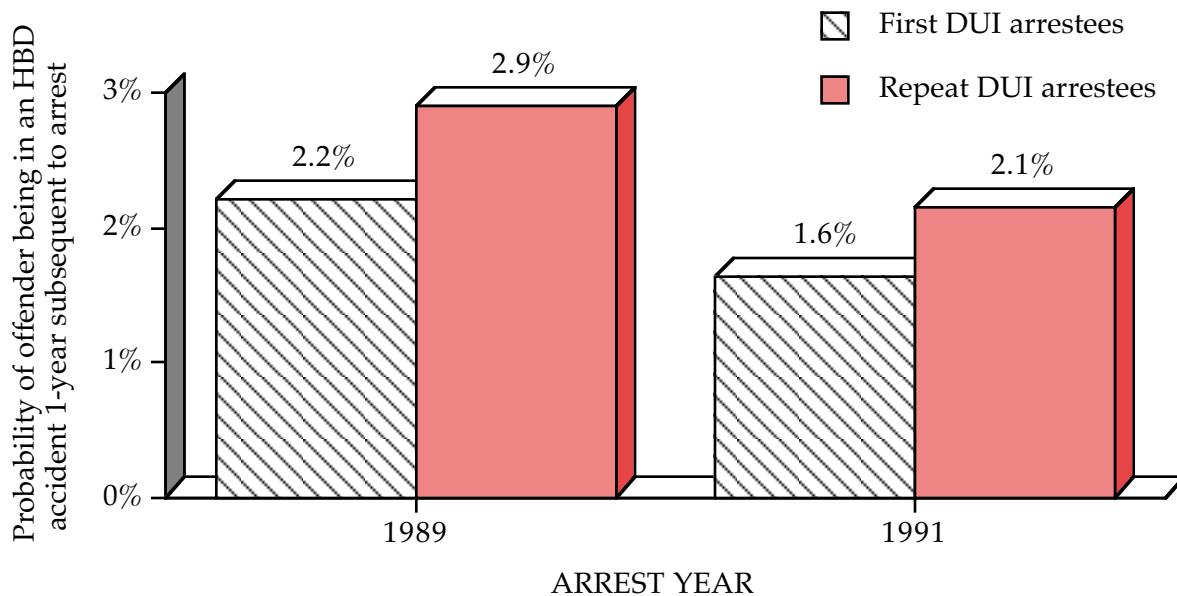


Figure 2. Adjusted probability of being in an HBD accident 1-year subsequent to DUI arrest, by offender group and arrest year.

Figure 2 shows the higher proportion of HBD accidents among repeat versus first offenders as discussed above. It also indicates that first offenders arrested in 1991, post-APS, had 27.3% fewer HBD accidents than those arrested in 1989 ($[2.2\% - 1.6\%] \div 2.2\%$). Similarly, repeat offenders arrested in 1991 had 27.6% fewer HBD accidents than repeat offenders arrested in 1989 ($[2.9\% - 2.1\%] \div 2.9\%$). Simple effects tests showed that the decreases for each group were statistically significant ($X^2 = 147.132$, $df = 1$, $p < .0001$ and $X^2 = 2087.678$, $df = 1$, $p < .0001$, respectively, for first and repeat offenders).

Again, there were no statistically significant interactions between the effects of arrest year and offender group, indicating that the effects of the law did not vary as a function of offender status.

Subsequent DUI/Wet-Reckless Driving Convictions Among Arrested Offenders

The analysis of subsequent DUI or alcohol-related reckless driving convictions revealed a significant ($p < .05$) interaction between 2-year prior major convictions and offender group. However, the magnitude of the interaction was only 17% of the main effect of offender group, and there was no evidence of 2- or 3-way interactions involving year. Consequently, since the interaction did not differ across years, and was of a small magnitude, the interaction was dropped prior to the final analysis. The final logistic regression analysis results are presented in Table 6, below.

Table 6

Logistic Regression Model Predicting 1-Year Subsequent DUI or Alcohol-Related Reckless Driving Convictions for DUI Offenders Arrested in Either 1989 or 1991

Predictor variable	Wald chi-square	<i>p</i> > chi-square	Regression estimates	Odds ratios <u>1989</u> 1991
Intercept	89615.4293	.0001	-2.4778	
Covariate block				
Age (x10)	185.2527	.0001	-0.0067	0.935
Gender	310.6862	.0001	-0.2886	0.749
License class	3.9567	.0467	0.0540	1.056
2-yr prior major convictions	31.8541	.0001	0.0435	1.044
2-yr prior minor convictions	351.1175	.0001	0.0578	1.060
2-yr prior total accidents	9.3263	.0023	0.0319	1.032
2-yr prior fatal and injury accidents	63.6678	.0001	-0.1364	0.873
2-yr prior license suspension violation convictions	68.9554	.0001	0.0605	1.062
Offender group (first offender = 0)	1084.1554	.0001	0.3639	1.439
Arrest year (1991 = 0)	689.3413	.0001	0.2547	1.290

Deriving the inverse of the odds ratios, it can be determined that, across offender groups, the odds of drivers arrested for DUI in 1991 being convicted of a DUI violation 1-year subsequent to their arrest were only 0.78 times that of those arrested in 1989. This equates to the odds of the post-law offenders recidivating being 22% less ($1 - 0.78 \times 100 = 22$) than those of offenders arrested in the pre-law period. Across years, the odds of repeat offenders recidivating 1-year subsequent to their arrest were 1.439 times greater than those of first offenders.

Figure 3 shows the adjusted proportion of offenders who received a 1-year subsequent DUI or alcohol-related conviction for each of the offender groups for both pre- and post-APS years. Again, adjustments reflect the impact of the inclusion of the prior record and driver characteristic indicators which served as covariates in the analyses.



Figure 3. Adjusted probability of recidivating 1-year subsequent to DUI arrest, by offender group and arrest year.

These data indicate that first offenders who were arrested in 1991, post-APS, were 21.1% less likely to receive subsequent DUI convictions than were those arrested in 1989 ($[10.9\% - 8.6\%] \div 10.9\%$). Repeat offenders arrested in 1991 were 19.5% less likely to receive subsequent DUI convictions than repeat offenders arrested in 1989 ($[14.9\% - 12.0\%] \div 14.9\%$). Simple effects tests showed that these decreases over time were statistically significant ($X^2 = 168.584$, $df = 1$, $p < .0001$ for the decrease among first offenders and $X^2 = 440.129$, $df = 1$, $p < .0001$ for the decrease among repeat offenders).

As in both of the preceding analyses, there were no statistically significant interactions between the effects of arrest year and offender group, indicating that the effects of the law did not vary as a function of offender status.

Study 2 Findings

Group Characteristics

After removing offenders for whom the group qualifying convictions were dismissed or were unmatchable to a legitimate California driver license, there were 124,064 DUI convictions represented in the DMV data file. Of those, 66,475 were from 1987 (prior to

the new laws) and the remaining 57,589 were from 1992 (after implementation of the new laws). Recall that this study was limited to DUI convictees since all arrestees were not available for any year prior to 1989 and alcohol-related reckless driving convictions were not counted among the 1987 conviction data that were available.

After matching the post-APS convictees with their driver records, it was found that 94.4% of the 1992 convictees could be identified as actually having received an APS action.

Table 7 presents the number of convictions by offender group and arrest year represented on the DMV DUI conviction data file.

Table 7

DUI Convictions by Offender Group and Conviction Year for DUI Offenders Convicted Between June and September in the Years 1987 and 1992

Conviction year	First DUI convictees	Repeat DUI convictees
1987		
Total	43,600	22,875
%	66%	34%
1992		
Total	37,668	19,921
%	65%	35%

From the figures presented in Table 7 it can be seen that there were fewer cases overall in the 1992 sample. The mean age of the total sample of offenders convicted in either 1987 or 1992 was 32.6 years old and was almost identical for both years. Males convicted of DUI continued to outnumber females by about seven to one (male percentage 1987 = 87.2%; male percentage 1992 = 87.4%).

Logistic Regression Models for the Four-Month Sample of Convicted DUI Offenders

In contrast to Study 1, all offenders in Study 2 were *convicted* of DUI as a result of their “group-qualifying” arrest. Consequently, as previously indicated in the Method section, while individuals convicted of only wet-reckless driving were included in Study 1, they were not available for inclusion in Study 2. Recall that offenders with prior wet-reckless convictions would have been included as *repeat* offenders in Study 1; such offenders are excluded here.

As in Study 1, in Study 2 the initial logistic regression analyses produced evidence of several significant ($p < .05$) covariate by offender group interactions. As before, in all cases the resulting significant interaction effects proved to be less than one-fourth the magnitude of the main effect of offender group and since, in each case, the offender

group main effects were of substantially greater magnitude than the interaction effects, conclusions about offender group differences were based on subsequent analyses that did not include those interactions.

Subsequent Total Accidents Among Convicted Offenders

The final logistic regression analysis of subsequent 1-year total accidents revealed no evidence of either significant ($p < .05$) covariate by offender group, or covariate by arrest year, interactions. The results of this analysis are presented in Table 8.

Table 8

Logistic Regression Model Predicting 1-Year Subsequent Total Accidents for
DUI Offenders Convicted between June and September of 1987 or 1992

Predictor variable	Wald chi-square	$p >$ chi- square	Regression estimates	Odds ratios $\frac{1987}{1992}$
Intercept	19017.0015	.0001	-2.8984	
Covariate block				
Age (x10)	117.1575	.0001	-0.0132	0.876
License class	36.3823	.0001	-0.3349	0.715
2-yr prior minor convictions	254.8666	.0001	0.1122	1.119
DUI offender conviction status (first offender = 0)	51.2255	.0001	-0.1775	0.837
Arrest year (1992 = 0)	389.0706	.0001	0.4852	1.624

As in Study 1, first offenders served as the reference group in this study. That is, the offender group variable uses the group with one DUI conviction as the standard to which the group with two or more DUI convictions is compared.

These results indicate that the odds that drivers who were convicted in 1992 would be involved in an accident within 1 year subsequent to their arrest were only 0.62 times the odds of offenders convicted in 1987 (derived from the equation $1 \div 1.624 = 0.62$). This equates to the odds of the sample of 1992 post-law offenders incurring a subsequent accident being 38% less ($1 - 0.62 \times 100 = 38$) than those of the sample of offenders arrested in the 1987 pre-law period. From the resulting odds ratio it can be seen that the odds of repeat offenders being in an accident 1 year subsequent to their arrest were 0.837 times those of first offenders. Conversely, the inverse of the odds ratio reveals that the odds of first offenders incurring a subsequent accident were 1.195 times ($1 \div 0.837 = 1.195$) greater than those of repeat offenders.

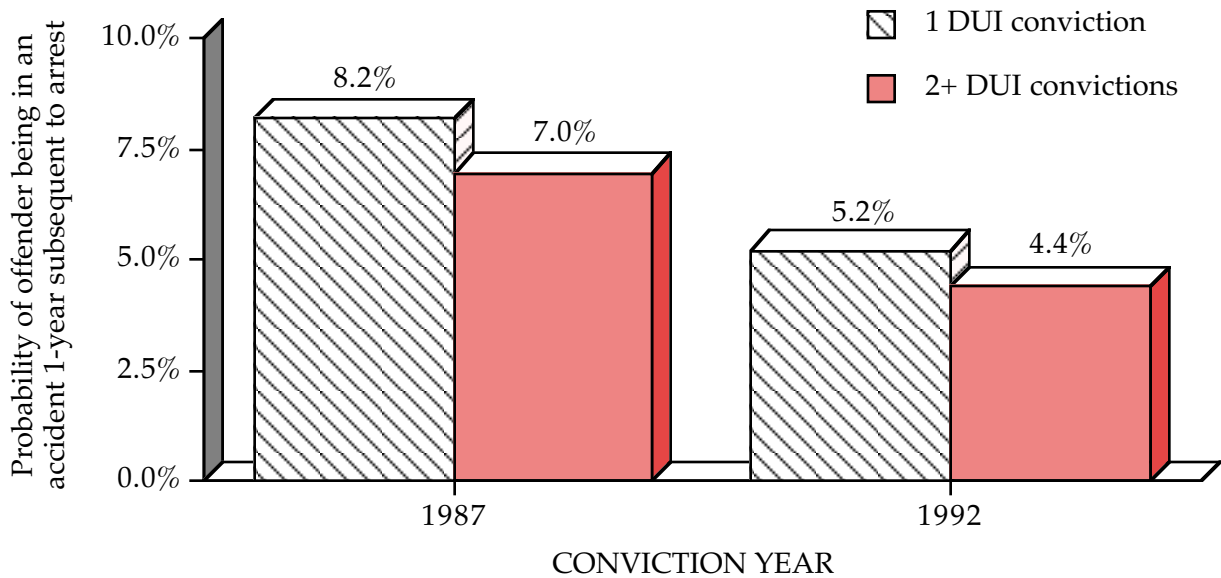


Figure 4. Adjusted probability of being in an accident 1-year subsequent to a DUI conviction, by offender group and conviction year.

Figure 4 shows the adjusted proportion of 1-year-subsequent total accident-involved drivers by group for both pre- and post-law years. These data indicate that offenders having one DUI conviction and convicted in 1992 were 36.6% less likely to be involved in a subsequent accident than were those convicted in 1987 $([8.2\% - 5.2\%] \div 8.2\%)$. Similarly, repeat offenders convicted in 1992 were 37.1% less likely to be involved in a subsequent accident than were repeat offenders convicted in 1987 $([7.0\% - 4.4\%] \div 7.0\%)$. Simple effects tests showed that the decreases for each group were statistically significant ($X^2 = 284.520, df = 1, p < .0001$ and $X^2 = 128.144, df = 1, p < .0001$, for first and repeat offenders, respectively). Again, there were no statistically significant interactions between the effects of arrest year and offender group, indicating that the effects of the laws (years) did not vary as a function of offender status.

Subsequent Alcohol-Related (HBD) Accidents Among Convicted Offenders

The final analysis of alcohol-related (HBD) accidents revealed no evidence of either significant ($p < .05$) covariate by offender group, or covariate by arrest year, interactions. The final logistic regression analysis results are presented in Table 9.

Table 9

Logistic Regression Model Predicting 1-Year Subsequent Alcohol-Related (HBD) Accidents for DUI Offenders Convicted Between June and September of 1987 or 1992

Predictor variable	Wald chi-square	<i>p</i> > chi-square	Regression estimates	Odds ratios $\frac{1987}{1992}$
Intercept	13242.0152	.0001	-4.1036	
Covariate block				
Age (x10)	34.43300	.0001	-0.0113	0.893
Gender	11.7746	.0014	-0.2156	0.818
2-yr prior total accidents	26.6813	.0001	0.2039	1.204
2-yr prior fatal and injury accidents	15.8035	.0001	-0.2688	0.765
2-yr prior minor convictions	28.3038	.0001	0.1122	1.067
DUI offender status (first conviction = 0)	31.1658	.0001	0.2283	1.244
Arrest year (1992 = 0)	98.3299	.0001	0.4295	1.497

The inverse of the odds ratio obtained in this analysis revealed that, across offender groups, the odds of drivers convicted of DUI in 1992 being involved in an HBD accident 1-year subsequent to their arrest were only 0.668 times those of offenders convicted in 1987. Thus, the odds of the sample of 1992 post-law offenders incurring a subsequent HBD accident were 33% less ($1 - 0.668 \times 100 = 33$) than those of the sample of offenders arrested in the 1987 pre-law period. Across years, the odds of repeat offenders incurring an HBD accident 1 year subsequent to their arrest were 1.244 times greater than those of first offenders.

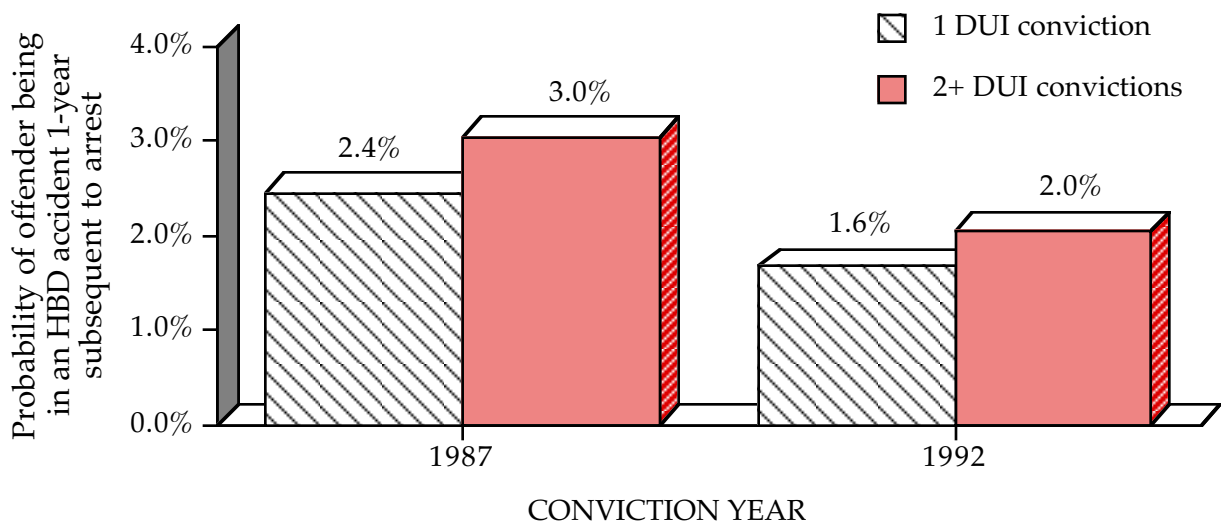


Figure 5. Adjusted probability of being in an HBD accident 1-year subsequent to DUI arrest, by offender group and conviction year.

Figure 5 displays the adjusted proportion of 1-year subsequent HBD accident-involved drivers for the offender groups for both pre- and post-APS years. The data indicate that both first offenders and repeat offenders convicted in 1992 were 33.3% less likely to be involved in a subsequent HBD accident following their arrest than were such offenders convicted in 1987 ($[2.4\% - 1.6\%] \div 2.4\%$) and ($[3.0\% - 2.0] \div 3.0\%$) for first and repeat offenders, respectively). Simple effects tests showed that these decreases were statistically significant ($X^2 = 63.372, df = 1, p < .0001$ and $X^2 = 41.374, df = 1, p < .0001$, for first and repeat offenders, respectively). Again, there were no statistically significant interactions between the effects of arrest year and offender group.

Subsequent DUI/Wet-Reckless Driving Convictions Among Convicted Offenders

As in each of the preceding analyses, the analysis of subsequent DUI or alcohol-related reckless driving convictions revealed no evidence of either significant ($p < .05$) covariate by offender group interactions or covariate by arrest year interactions. The final logistic regression analysis results are presented below in Table 10.

Table 10

Logistic Regression Model Predicting 1-year Subsequent DUI or Alcohol-Related Reckless Driving Convictions for DUI Offenders Convicted Between June and September of 1987 or 1992

Predictor variable	Wald chi-square	$p > \text{chi-square}$	Regression estimates	Odds ratios <u>1987</u> <u>1992</u>
Intercept	21309.6318	.0001	-2.6930	
Covariate block				
Age (x10)	51.0378	.0001	-0.00737	0.929
Gender	141.0995	.0001	-0.4277	0.652
2-yr prior minor convictions	101.7060	.0001	0.0705	1.073
2-yr prior fatal and injury accidents	16.7013	.0002	-0.1208	0.886
2-yr prior license suspension violation convictions	52.6962	.0001	0.1217	1.129
DUI offender status (first conviction = 0)	374.1893	.0001	0.4058	1.500
Arrest year (1992 = 0)	237.0694	.0001	0.3261	1.386

The inverse of the odds ratios obtained in this analysis revealed that, across offender groups, the odds of drivers who were convicted of DUI in 1992 recidivating within 1-year subsequent to their arrest were only 0.722 times ($1 \div 1.386 = 0.722$) those of drivers convicted in 1987. This equates to an odds reduction of 28% ($1 - 0.722 \times 100 = 28$) compared to those of offenders arrested in the 1987 pre-law period. Across years, the odds of repeat offenders recidivating were 1.5 times greater than those of first offenders.

Figure 6 shows the adjusted proportion of offenders who received a 1-year-subsequent DUI conviction for each of the offender groups for both pre- and post-APS years. These data indicate that first offenders convicted in 1992 were 26.7% less likely to

recidivate following their arrest than were first offenders convicted in 1987 ($[8.6\% - 6.3\%] \div 8.6\%$). Repeat offenders convicted in 1992 were 25.2% less likely to recidivate following their arrest than were repeat offenders convicted in 1987 ($[12.3\% - 9.2\%] \div 12.3\%$). Simple effects tests showed that these decreases were statistically significant ($X^2 = 144.679, df = 1, p < .0001$ and $X^2 = 106.877, df = 1, p < .0001$, for first and repeat offenders, respectively). Again, the absence of a significant interaction between year and offender status indicates that the effect of the law did not vary as a function of offender status.

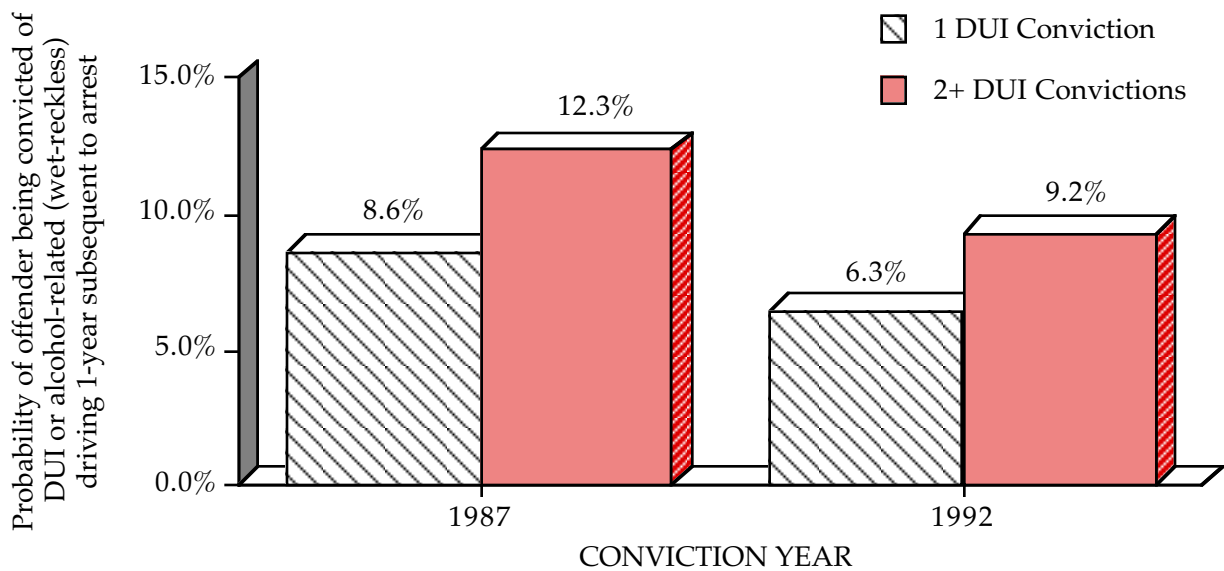


Figure 6. Adjusted probability of being convicted on a 1-year subsequent DUI or wet-reckless charge, by offender group and conviction year.

Approximate Number of Accidents or DUI Incidents Prevented

To estimate the number of accidents or DUI incidents prevented as a result of the new laws, the probability of being in a subsequent accident, or of recidivating, in the post-law period (1991) was subtracted from the comparable pre-law probability (1989) for the offenders included in Study 1. Study 1 data were used in deriving estimates because that data includes the entire population of offenders who receive, or would be affected by, the APS suspension. The probabilities used in this calculation were those obtained from the logistic regression analyses and therefore adjusted for the relative effects of the covariates. The resulting differences were then multiplied by the number of offenders in the post-law period. The results were then used to estimate the reduction in the number of accident- or DUI-incident involved drivers for each dependent variable. These estimates slightly underestimate the actual number of events (either accidents or DUI incidents) since they assume a maximum of one incident per person. The resulting estimates are presented in Table 11 below. The impact of the laws translate into roughly 6,000 fewer accidents and 5,800 fewer alcohol related convictions

among convicted DUI offenders during 1991. The effect on HBD accidents (approximately 1,500 fewer) is less dramatic than on total accidents, but this estimate is very conservative because police accident investigations are not very reliable in detecting low or moderate levels of alcohol.

Table 11
Estimated Reductions in 1-Year Subsequent Accidents
and Convictions, by Offender Group

Dependent measure	Estimated driver involvements prevented*
Total accidents	
First offenders	4,500
Repeat offenders	1,700
Total	6,200
HBD accidents	
First offenders	1,000
Repeat offenders	500
Total	1,500
DUI/wet-reckless convictions	
First offenders	3,700
Repeat offenders	2,100
Total	5,800

*Rounded to nearest 100.

DISCUSSION

This evaluation has demonstrated that the introduction of the 0.08% BAC limit and the APS license suspension laws in 1990 were highly effective in reducing alcohol-related accidents and recidivism among DUI offenders, whether or not the offenders were actually convicted of their offense. In the years following the new laws, there were significant reductions in all of the indices of recidivism that were assessed in this study, including 1-year subsequent HBD and total accidents, and 1-year subsequent DUI or plea bargained "wet-reckless" convictions. Furthermore, these significant reductions in recidivism were found among all groups of offenders.

The reductions from pre- to post-years were all fairly large, ranging in magnitude from 19.5% to 37.1% across the various measures assessed in the evaluation. The 4-month samples of offenders convicted in 1992 had even larger reductions across all of the post-law recidivism measures assessed than did the 1-year samples of offenders arrested in 1991. The consistent effects across studies occurred in spite of the fact that the groups in the two studies were, by necessity, not identically defined.

Impact of the APS and 0.08% Laws on the Specific Dependent Measures

The most dramatic effect of the new laws was in reducing the total accident rate of DUI offenders. A post-law offender's chances of being in an accident were estimated to be 33.8% to 37.1% lower than those of offenders arrested prior to the new laws. Following the new laws, an offender's chances of incurring an HBD accident one year subsequent to arrest were also significantly reduced, though by slightly less magnitude, with estimated reductions ranging between 27.3% and 33.3%. Similarly, 1-year subsequent DUI and wet-reckless convictions also dropped significantly with estimated reductions ranging between 19.5% and 26.7% depending on the offender's prior conviction status. When applied to total accidents, the results suggest that the new laws prevented 6,200 accidents in 1991 alone.

Effects Associated with the APS Law

Although past research by Stewart, Gruenewald, and Roth (1989) produced compelling evidence of a specific deterrence effect attributable to APS laws, their evaluation assessed the effects in states which had no (or minimal) provisions for mandatory post-conviction suspensions. California, on the other hand, has historically relied on post-conviction license suspension as an important sanction for repeat offenders, and the impact of post-conviction suspension on reducing recidivism is supported by the results of numerous studies. One might therefore expect that the APS law would produce a less marked effect in California. However, almost 70% of DUI offenses in California involve first offenders, and very few first offenders (and virtually none of the offenders convicted of wet-reckless) would have been given a post-conviction suspension prior to the introduction of the APS law. Therefore, for most offenders in California the APS suspension would have been their only license suspension. Consequently, in spite of the state's historical use of post-conviction suspension for repeat offenders, it should not be surprising that the APS suspension produced substantial incremental effects in deterring subsequent recidivism and accidents. Additionally, in accordance with deterrence theory (Ross, 1982), the relative immediacy and certainty of the pre-conviction suspension should cause the APS suspension to be more effective than post-conviction suspension.

While it is impossible to partition the reductions obtained here into the unique contribution attributable to either the 0.08% BAC or APS law, it can be assumed that most of the impact is attributable to the imposition of the administrative per se license suspension law. This is because the APS law imposed a suspension on almost all of the offenders included in the analyses, while proportionately few of the offenders had a BAC level between 0.08% and 0.099% (the only offenders affected by the new 0.08% BAC limit law). While the BAC levels were not available for the offenders in these studies, it is known that only 7.4% of all post-law DUI or wet-reckless convictees have a BAC of between 0.08% and 0.099%. The average BAC level for all DUI offenders was 0.17% prior to the new lower BAC limit law and has been only slightly less (0.16%) since enactment of the law. From these facts alone, it is clear that the additional number of offenders impacted by the reduced BAC threshold was small. Using the approach described in the next section, we estimate that roughly 94% of the laws' impact can be attributed to APS.

Effects Associated with the 0.08% BAC Law

As noted above, the contribution of the 0.08% law to the observed accident and recidivism reductions is limited by the number of offenders with BAC's of 0.08%-0.099%. Although the 0.08% law resulted in a three-fold increase in the number of offenders in this interval, they still comprise only a small proportion of all convicted DUI offenders. Only 3.6% of all DUI convictions in 1991, and 3.7% of all DUI convictions in 1992, were of offenders in the 0.08% to 0.099% range. This increase, in turn, would result in roughly 3,300 additional suspensions per year. Therefore, we can estimate that, at most, only 3.7% of the reductions in the recidivism measures can be attributed to effects resulting from imposition of the 0.08% law. Applying this factor to the present data produces estimated reductions of roughly 220 fewer total accidents, 50 fewer HBD accidents, and 210 fewer alcohol-related convictions, attributable to the 0.08% law.

Changes in Enforcement

Between 1987 and 1992 there was a 34.3% decrease in the number of DUI misdemeanor arrests. It might be argued that the decrease in DUI recidivism assessed in this study reflects a reduction in DUI enforcement resources. However, we know of no evidence supporting a reduction in police DUI-enforcement activities. Furthermore, the consistent results across all of the measures, including total and alcohol-related accidents, for which there should be little change in law enforcement response, suggest that the decreases are not attributable to less enforcement. The likelihood that the actual incidence of DUI decreased in California is also supported by the general deterrent effect on the incidence of alcohol- and alcohol-surrogate accidents as reported in Volume 1 of this study (Rogers, 1995).

Impact of the APS and 0.08% Laws by Offender Status

The fact that there were no significant interactions between the arrest year (pre- versus post-law) and offender status (first versus repeat offenders) indicates that the deterrent impact of the new laws was fairly comparable among both first and repeat offenders. Overall, while first offenders had a higher probability of being involved in subsequent accidents of any kind, they had a significantly lower incidence of recidivating or of being involved in a subsequent HBD accident than did the repeat offenders across both years of the study. This suggests that first offenders may have been less "at risk" for DUI incidents to begin with. That is, as a group, they may actually drive drunk less frequently than do repeat offenders and/or they may be more responsive to the arrest-mediated intervention. This conjecture is supported by prior research (e.g. Tashima & Helander, 1997) which has found that first offenders tend to reoffend less than do repeat offenders. In any event, first offenders may have been more successful in at least curtailing their driving when they were alcohol impaired. This argument is further supported by the finding that this particular group was somewhat more likely to be in a subsequent accident than were repeat offenders, suggesting that they are probably not limiting their general driving exposure any more than repeat offenders but instead are driving less after drinking. The fact that repeat offenders are known to have a higher incidence of problem drinking and alcoholism provides further support for this conjecture.

The finding that repeat offenders had fewer subsequent accidents, particularly accidents not involving alcohol, might, in part, be reflective of the fact that repeat offenders generally receive more stringent sanctions than first offenders (Peck, 1991). For instance, in California a third DUI conviction within seven years results in a minimum jail term of no less than 90 days and a fourth conviction results in a minimum jail term of no less than 180 days, compared to only a 48-hour sentence, usually served performing community service, often required of first offenders. In spite of their lower overall accident involvement, however, repeat offenders were significantly more likely to be involved in an *alcohol-related* (HBD) accident in both the pre- and post-law periods than were first offenders. This evidence suggests that when they drive, repeat offenders, in general, are more likely to be driving drunk than are first offenders.

Validity Threats

Quasi-experimental evaluations such as this study are subject to a variety of extraneous factors which, in some cases, militate against forming valid conclusions about the true impact of the program or treatment that is being evaluated. It is therefore appropriate to consider whether the accident and DUI reductions obtained in this study might be attributable to factors other than the new DUI laws.

The present study used a research design that, by necessity, selected offenders from different time periods (the pre- and post-law groups). This type of design is vulnerable to biases from extraneous variables associated with the different time periods. The most obvious sources of potential bias would be: (1) changes in DUI enforcement and accident investigation practices in the two time periods, and (2) time-related trends toward reduced impaired driving and alcohol-related accidents. These two sources of bias, incidentally, are not independent since any systematic changes in (1) would be partly reflected in (2). A third source of potential bias would be the introduction of any other countermeasures and change agents during the post-law period. Although it is possible that some of the observed reductions are attributable to extraneous factors such as those just mentioned, the magnitude and consistency of the observed effects are too large to be easily explained by trend or any other known source of bias, as noted below.

First, the logistic regression models contained a number of covariates, including the prior accident, moving violation and major violation frequency of the groups. These covariates would reflect and at least partially adjust for differences in accident reporting and DUI enforcement over the time window represented by the prior record covariates.

Second, an analysis by Peck (1996) found evidence of no, or very negligible, linear trend toward reductions in the accident and DUI recidivism rates of first and repeat offenders during the period prior to the new laws (1984-1989). This finding may seem to conflict with evidence presented elsewhere (Fell & Nash, 1989; Insurance Institute for Highway Safety, 1993) showing a strong long-term trend, both nationally and in California, toward a reduced incidence of impaired driving and alcohol-related accidents. However, this latter trend relates to the total aggregate accident and impaired driving frequency of all drivers, not just the very small proportion of those who are arrested

for a DUI offense in a given year. In fact, the great majority of alcohol-related accidents and DUI offenses at any given time involve drivers with no prior DUI offenses on record. It is therefore not possible to generalize trends based on all drivers in estimating the expected accident and DUI *reoffense* rates of *convicted* DUI offenders.

Given the above, there remains little doubt that the positive findings reported here are largely attributable to the new laws.

Finally, there was the possibility that the impact of the pre-conviction administrative sanction might be affected by changes in post-conviction sanctions. However, this is not seen as a serious threat to the study's validity since: (1) there were no commensurate law changes affecting post-conviction sanctions during the years of the study, and (2) there were no appreciable changes in the application of existing sanctions that were made by the courts over the years evaluated (Tashima & Helander, 1992; 1994; 1995). The few differences in court sanction patterns that did occur following the new laws were so slight that they could not possibly account for the large decreases obtained in this study.

Continuity of the Findings Between Studies

The results of the 4-month sample analyses were remarkably quite comparable to the results from the main analyses (those assessing all arrested offenders) and both lead to the strong conclusion that the new laws produced a significant specific deterrent impact. The consistency between the sample results and those of the main analyses suggest that the magnitude of the reductions in the main analysis are not attenuated by the fact that the pre-law offenders from the latter part of 1989 were subject to the general deterrent effect of the APS and 0.08% laws during the follow-up period. Recall that this "noise" is present as a result of the fact that offenders who were arrested late in 1989 would potentially have been deterred from further DUI incidents after being made aware that subsequent arrests would result in harsher, more immediate license actions.

The 1-year follow-up period is too short to be able to conclude that there was a significant impact beyond the administrative suspension period among repeat offenders since the suspension length would at least equal the follow-up period of one year. However, first offenders comprised up to 70% of the file and would have received, at most, only a 4-month APS suspension term. While not all first offenders seek license reinstatement immediately after their suspension term ends, those that did reinstate would have been eligible to drive for some portion of the 1-year follow-up period.

In conclusion, this study demonstrates highly significant decreases in the likelihood of DUI offenders either reoffending or being involved in subsequent accidents after the new laws were imposed. The magnitude and consistency of the reductions provide compelling evidence that administrative license suspension is a highly effective means of reducing recidivism among both first and repeat DUI offenders. The enactment of the 0.08% law accentuated the net deterrent effect of the APS law by increasing the number of DUI offenders who were suspended.

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